




NORTH
Dakota
Be Legendary.™

| Water Commission



DEVILS LAKE

OUTLET ADVISORY UPDATE
2021

NORTH
Dakota | Water Commission
Be Legendary.™

May 12, 2021

OUTLINE

- **Introduction & Membership Term Review**
 - John Paczkowski, Interim State Engineer
- **Devils Lake Basin Review**
 - Jon Kelsch, SWC Director of Water Development
- **National Weather Service Situational Update**
 - Amanda Lee, NWS Grand Forks Service Hydrologist
- **2020 Operational Summary**
 - Tim Dodd, SWC Water Resource Engineer
- **2020 Water Quality Review**
 - Karl Rockeman, NDDEQ Director of Water Quality Division
- **Outlook For 2021 Outlet Operations**
- **Status By Committee Members**
- **Final Comments**



DLOMAC MEMBERSHIP TERMS

Devils Lake Outlet Management Advisory Committee

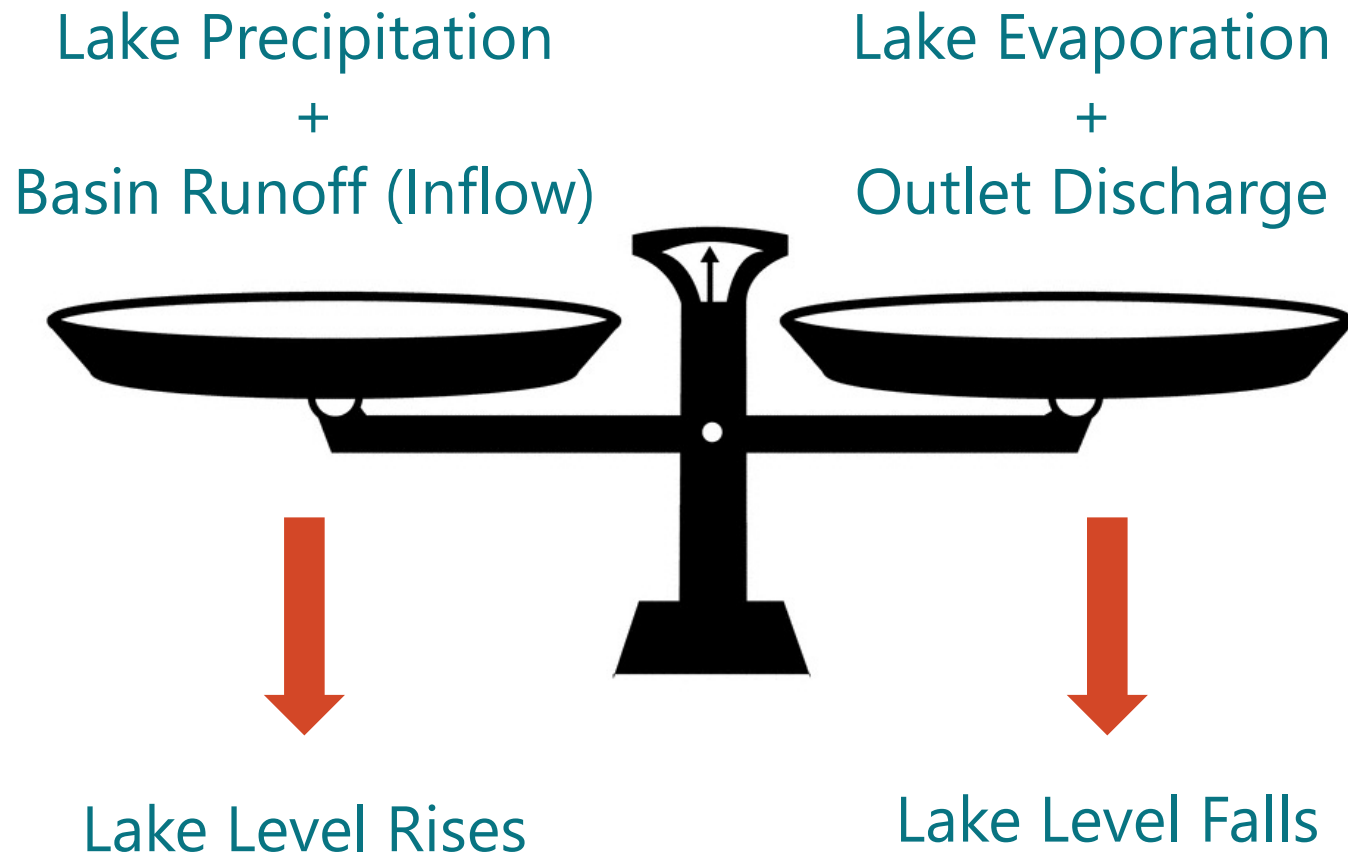
< Return

Board Summary	
Type	Advisory
Governed By	NDCC — https://www.legis.nd.gov/cencode/t61c36.pdf?20150709172913
Board Summary	In response to rising water levels at Devils Lake, the State of North Dakota constructed outlets to direct water out of the basin as necessary. The Devils Lake Outlet Management Advisory Committee exists to advise the governor and State Water Commission on the operations of all Devils Lake outlets. The committee may recommend criteria for operation of each outlet based on outflow volumes, water quality considerations and the risk of an overflow of Devils Lake. Localities surrounding the lake and downstream outlets — including the counties of Benson, Ramsey, Towner, Nelson and Barnes and the cities of Devils Lake, Valley City, Lisbon/Fort Ransom, Fargo and Grand Forks — are represented on the committee, as well as representatives from the legislative assembly, the Devils Lake Joint Water Resource Board, Spirit Lake Nation, Minnesota and Manitoba. Any recommendations developed by the committee must receive support from ten of the seventeen members of the committee before submission to the governor or State Water Commission. Any recommendation not receiving majority support but receiving support from at least five members may be submitted as a minority recommendation.
Compensation	Voluntary
Term Length	4 years, no term limit
Meeting Frequency	

Many Committee
Member Terms Expire
by 7/1/2021

Members With Upcoming
Term Expirations Are
Encouraged To Apply For
Reappointment Through The
Board Application Portal

DEVILS LAKE BASIN WATER BALANCE

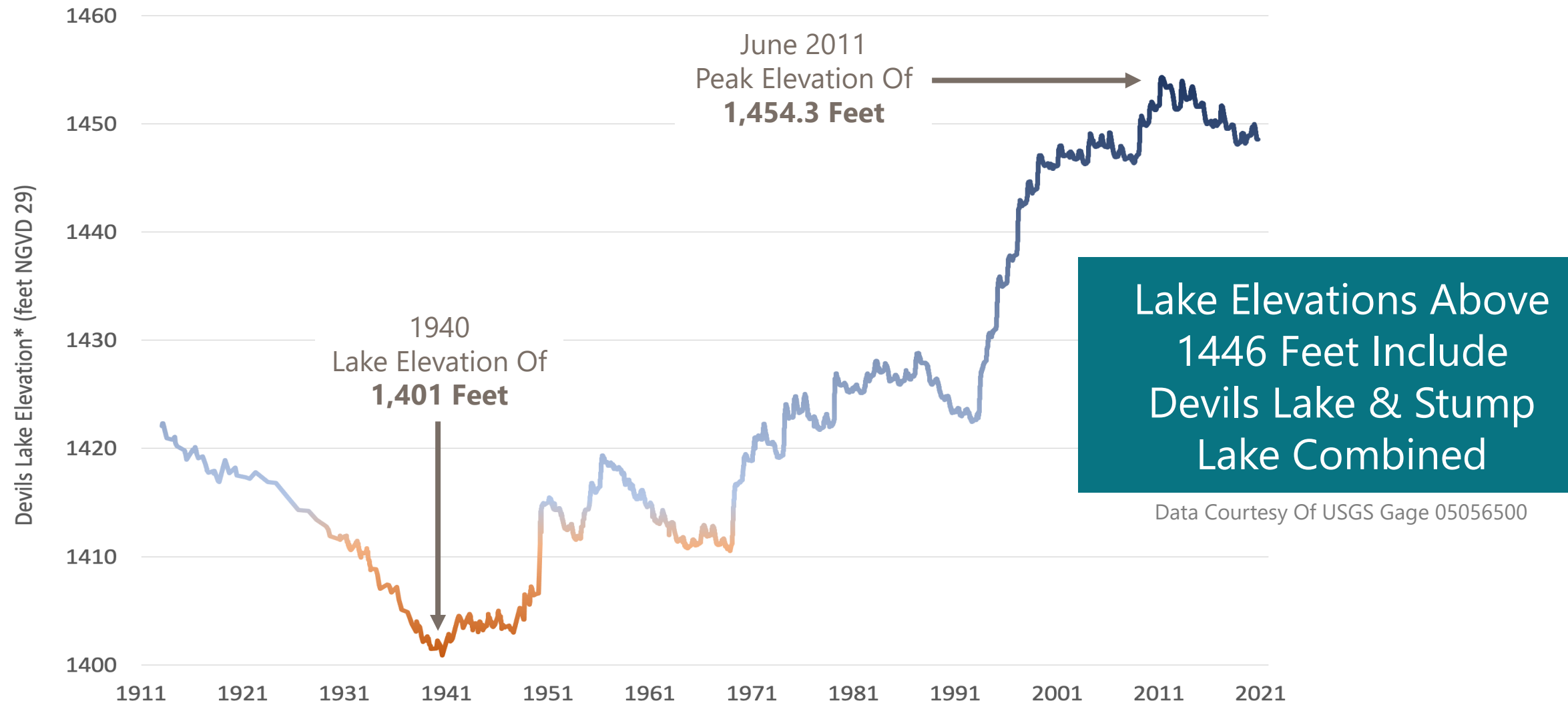


Average Annual Estimates (2010-2020)

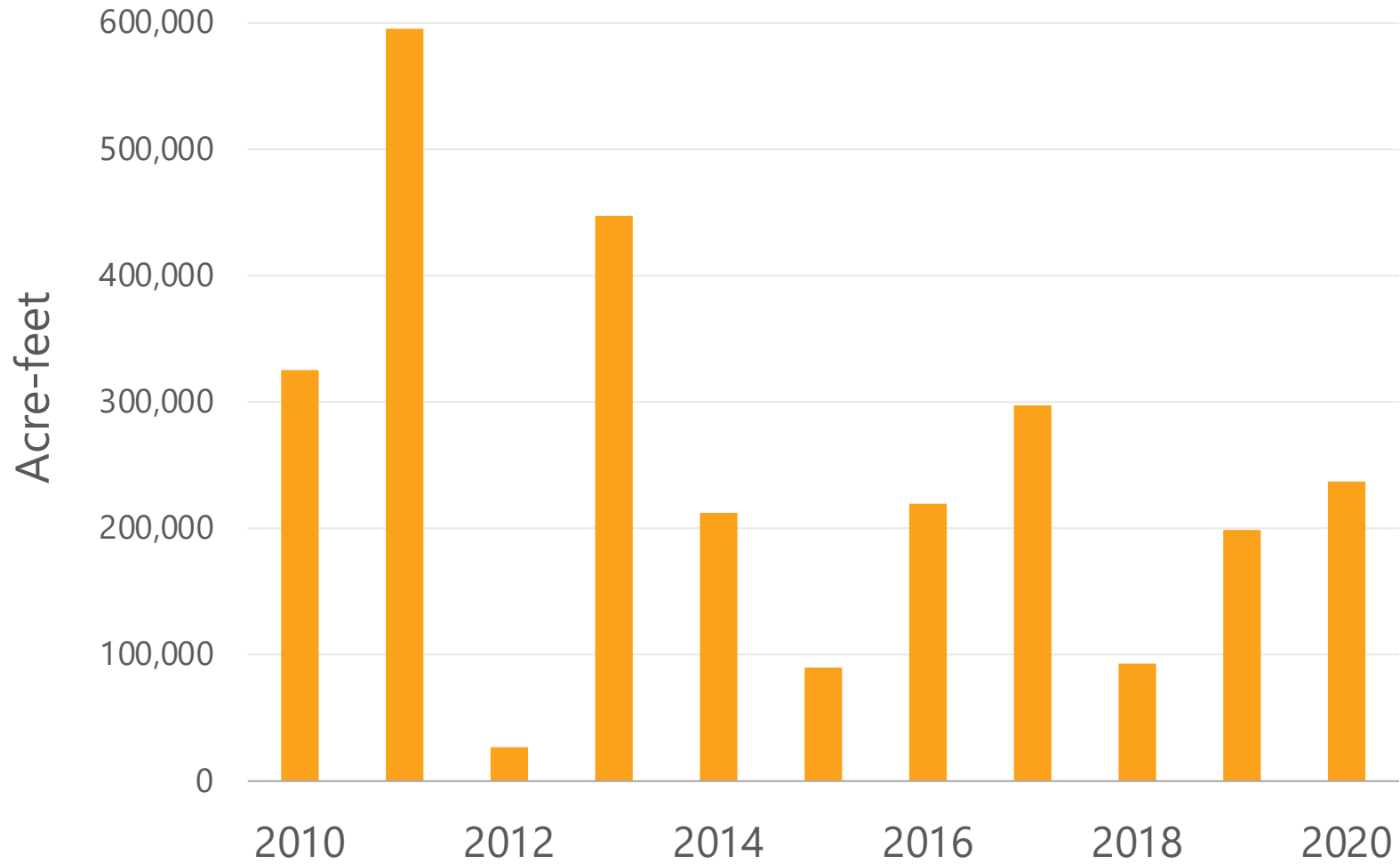
Precipitation = 20.4 Inches
Inflow = 249,300 Acre-Feet
(17.4 Inches On Average)

Evaporation = 30.3 Inches
Outlet Discharge = 116,000 Ac-Ft
(8.0 Inches On Average)

DEVILS LAKE PERIOD OF RECORD ELEVATION



DEVILS LAKE ESTIMATED INFLOW



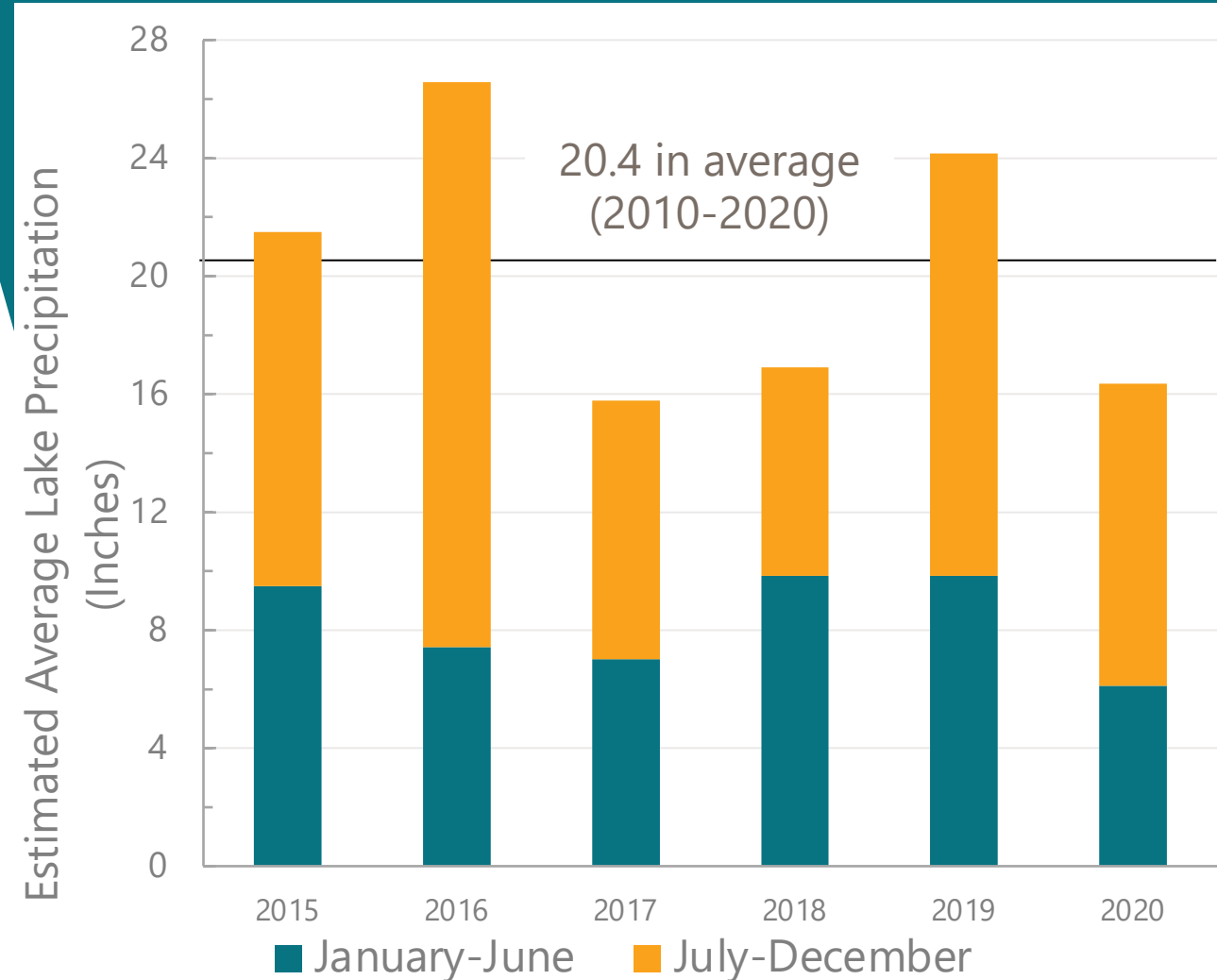
- Inflow Is Highly Variable & Influenced By Previous Years
- Average Inflow From 2010-2020 Has Been Approximately 249,300 Ac-Ft
- 2020 Estimated Inflow Was 237,000 Acre-Feet

DEVILS LAKE PRECIPITATION (2015-2020)

2020 Average Lake Precipitation
Estimated To Be 16.35 Inches

Drier Conditions In Three Of The
Four Past Years Have Contributed
To Lower Lake Elevations

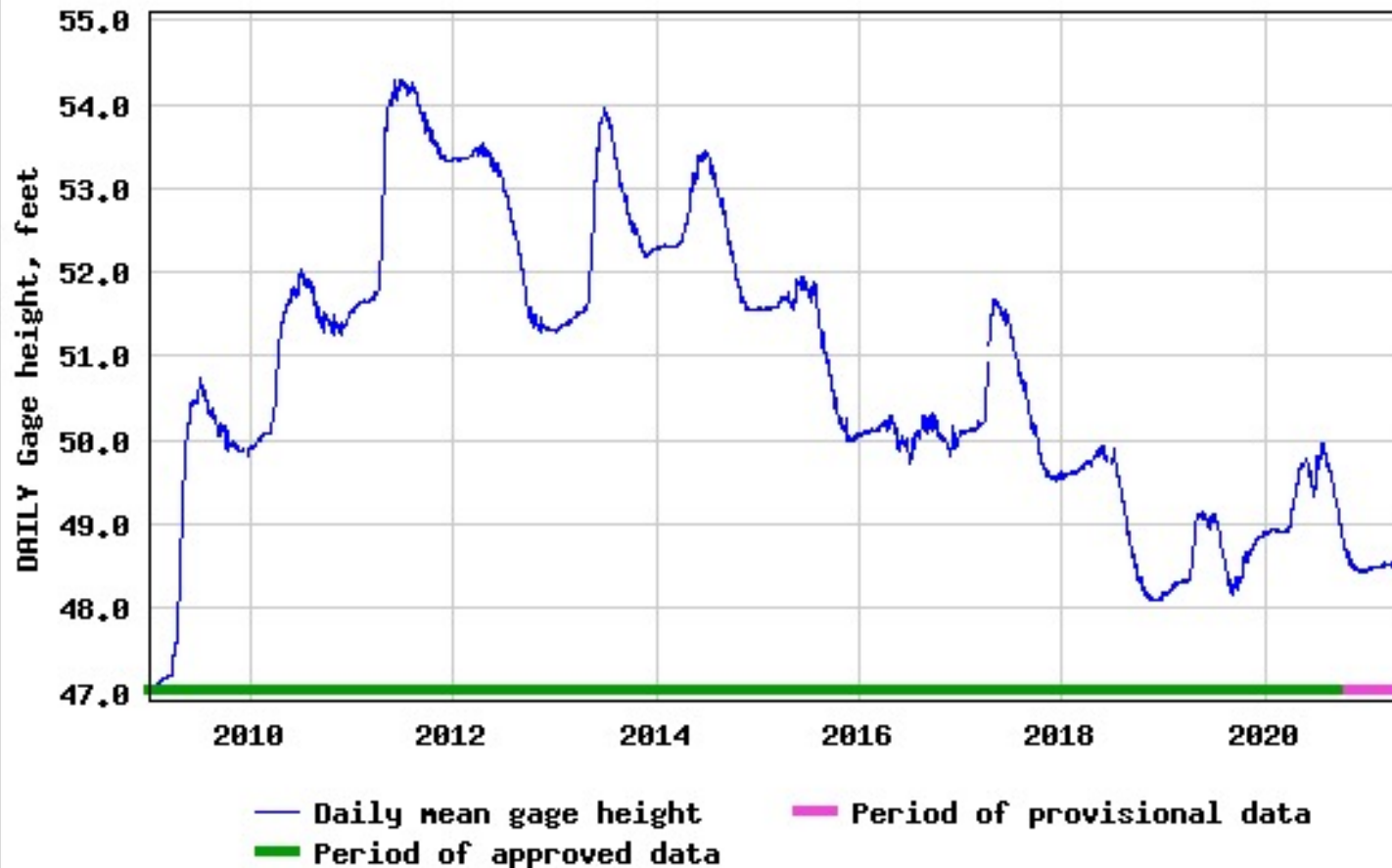
The Only Major
Precipitation Event In 2020
Occurred in Early July



LAKE ELEVATION 2009 - PRESENT



USGS 05056500 DEVILS LAKE NR DEVILS LAKE, ND



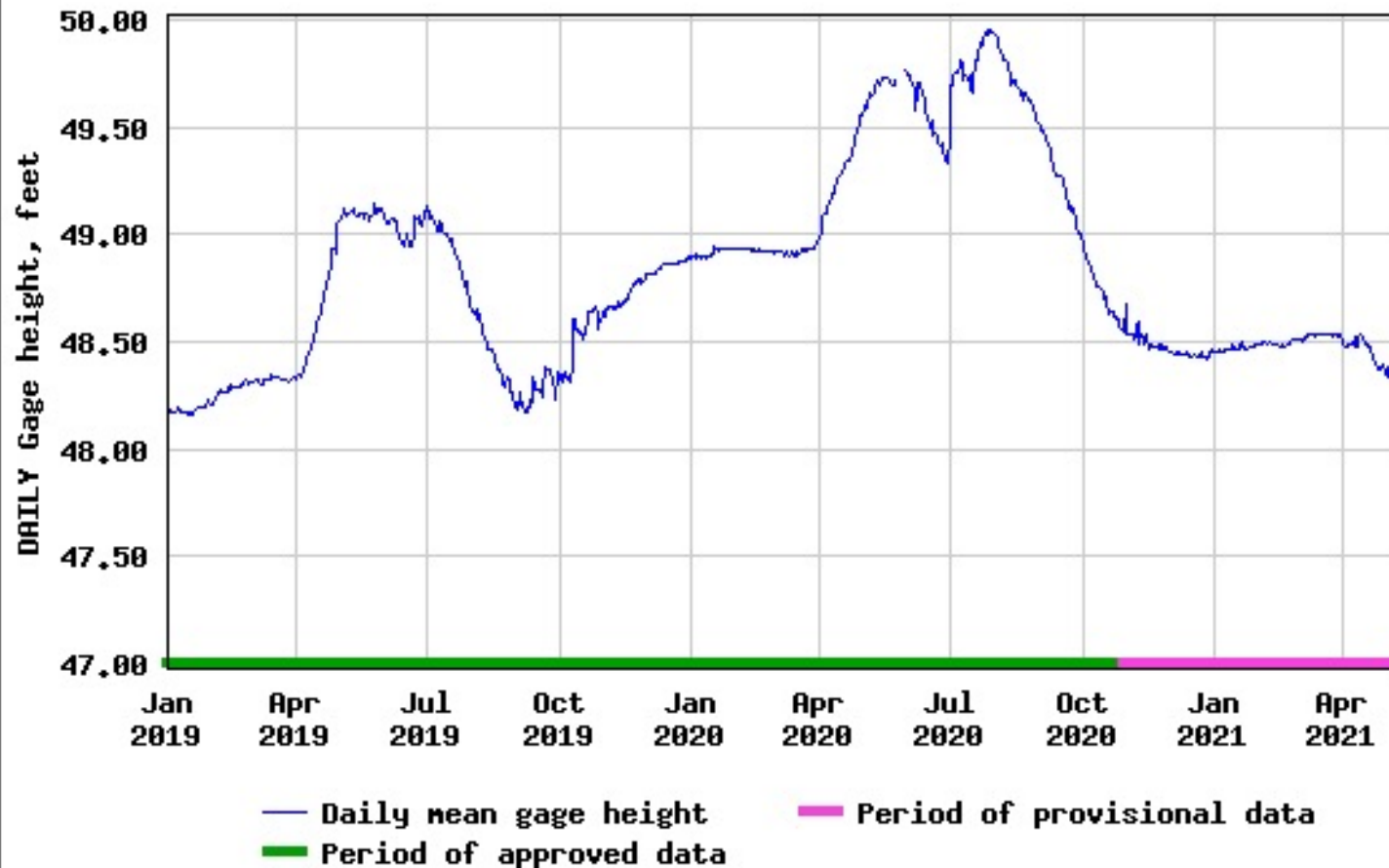
Devils Lake Peaked At
1454.3 Feet In 2011

The Lake Approached
But Did Not Reach 1448
Feet In 2018 & 2019

LAKE ELEVATION 2019 - PRESENT



USGS 05056500 DEVILS LAKE NR DEVILS LAKE, ND



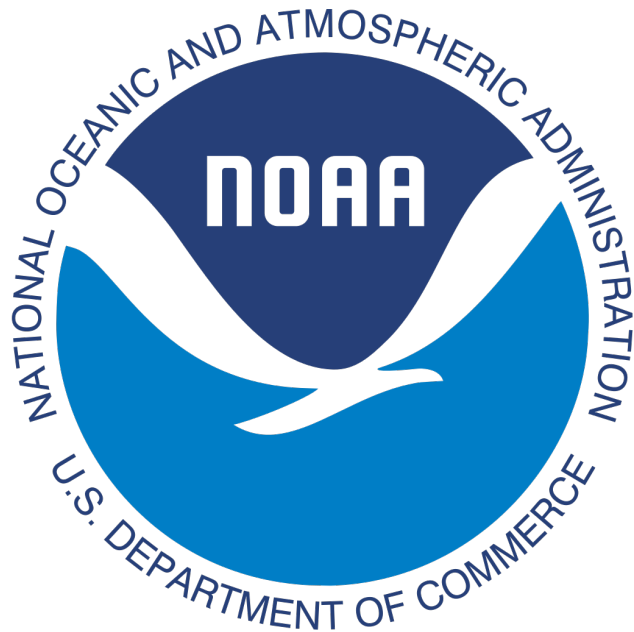
Historically Wet Conditions In The Fall Of 2019 Caused A Significant Lake Season Lake Rise

Devils Lake Peaked Just Under 1450 Feet In July 2020

In 2021, Lake Rise & Inflow Have Been Near Zero

NATIONAL WEATHER SERVICE UPDATE

Amanda Lee
NWS Grand Forks



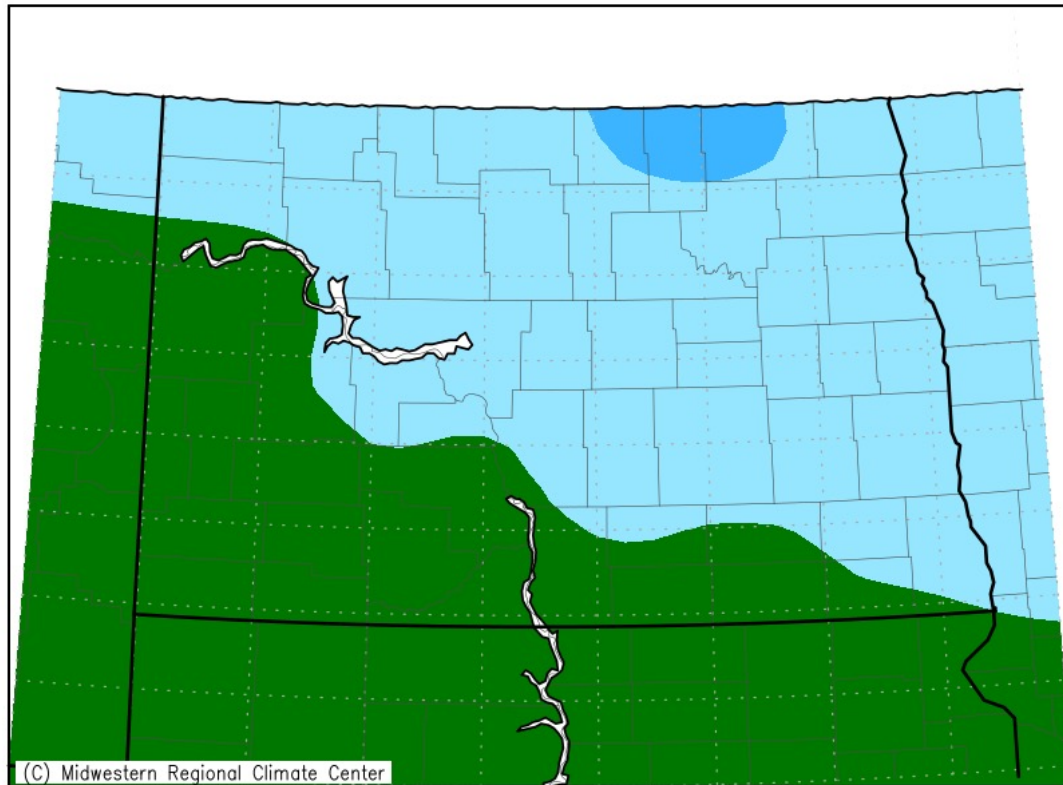
OVERVIEW

- Fall and Winter Review
- Upcoming Forecast/Climate Outlooks
- Lake Outlook
- Datum Change
- New Normals

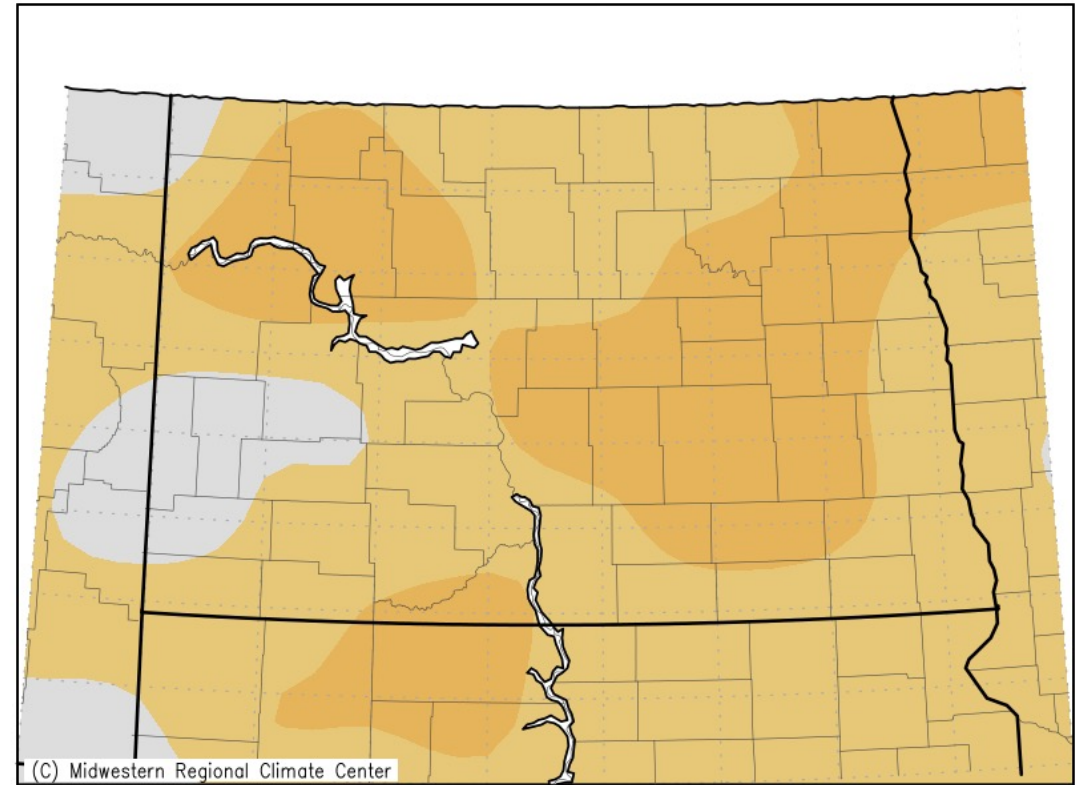


AVERAGE TEMPERATURE (October 2020 – Present)

Average Temperature (°F)
October 1, 2020 to May 9, 2021



Average Temperature (°F): Departure from Mean
October 1, 2020 to May 9, 2021



Mean period is 1991–2020.

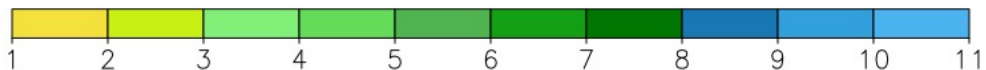
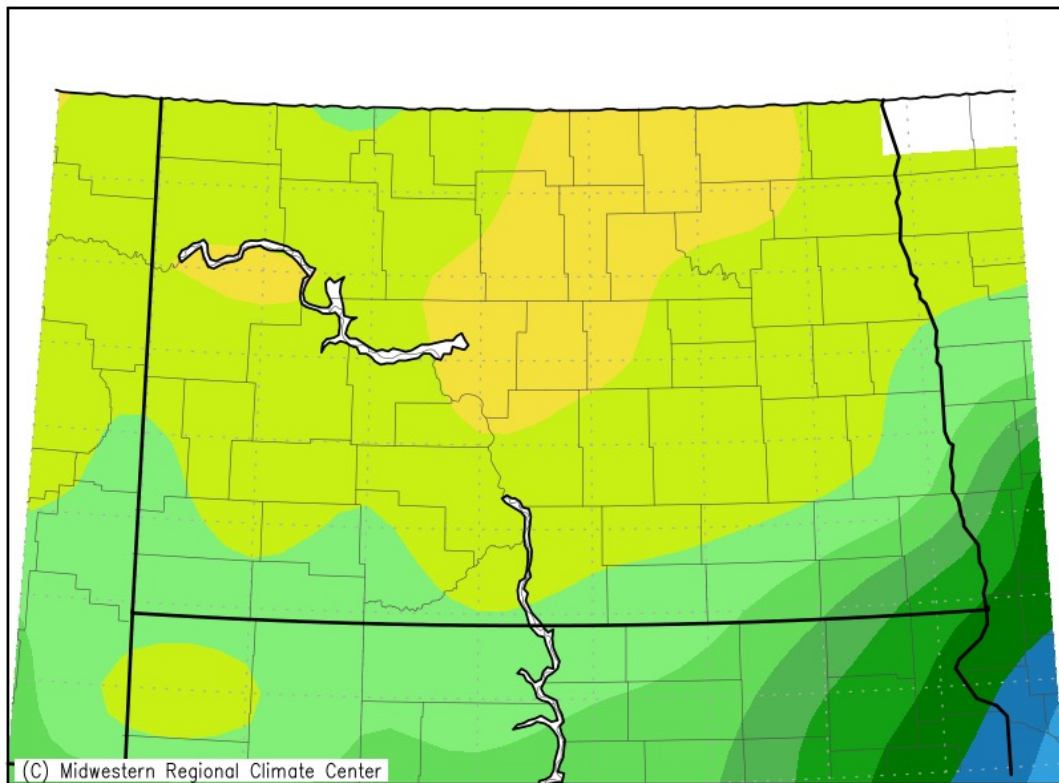




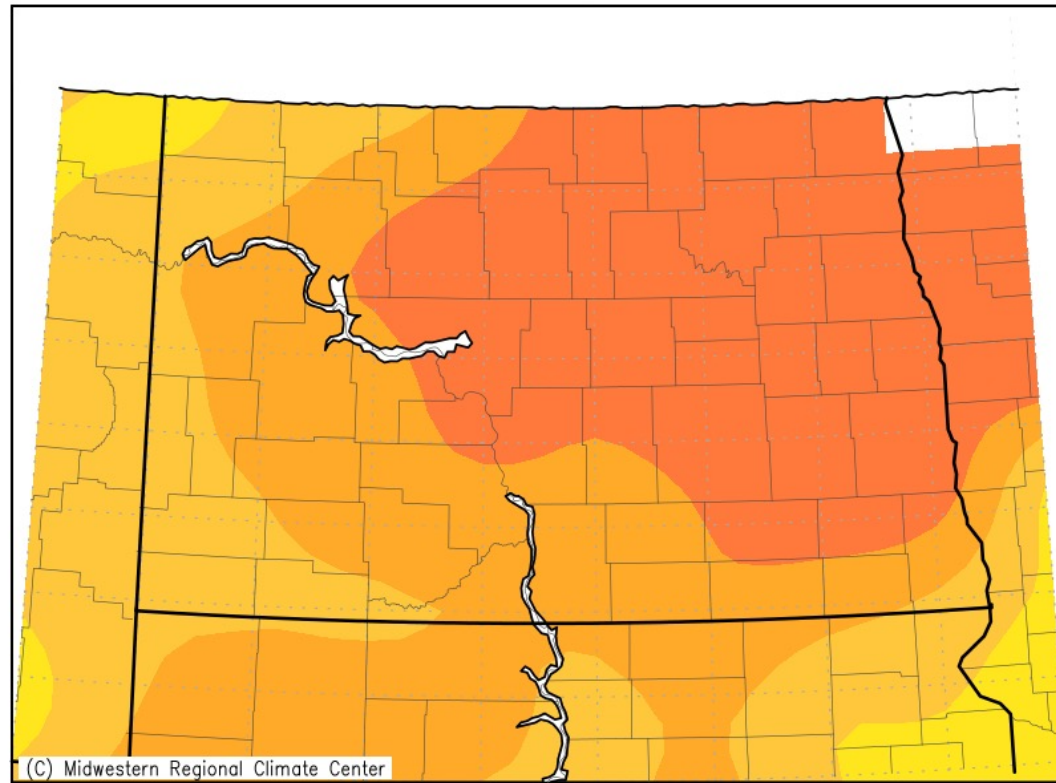
ACCUMULATED PRECIPITATION

(October 2020 – Present)

Accumulated Precipitation (in)
October 1, 2020 to May 10, 2021



Accumulated Precipitation (in): Departure from Mean
October 1, 2020 to May 10, 2021



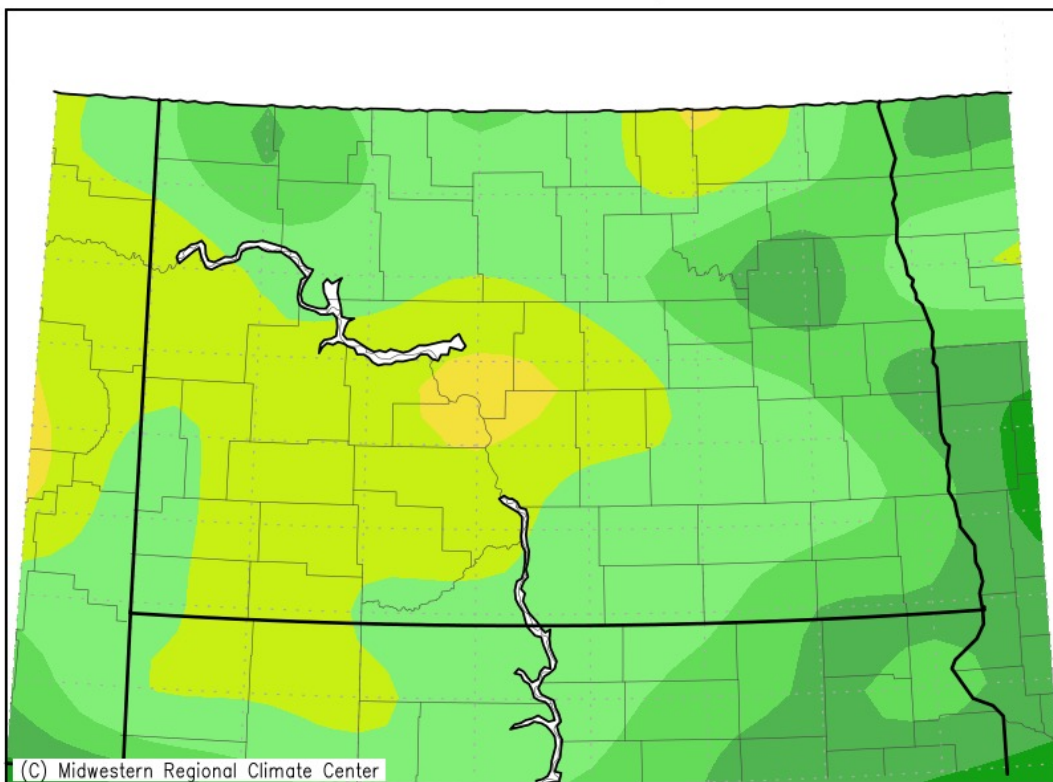
Mean period is 1991–2020.



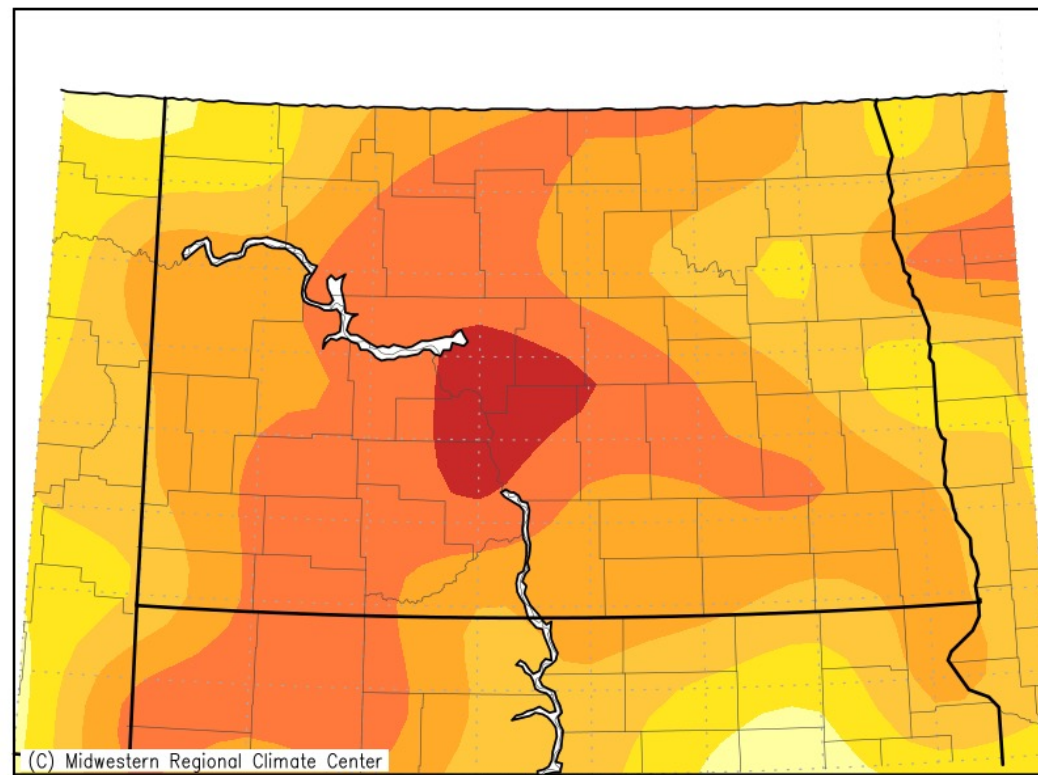


ACCUMULATED SNOWFALL (October 2020 – Present)

Accumulated Snowfall (in)
October 1, 2020 to May 10, 2021



Accumulated Snowfall (in): Departure from Mean
October 1, 2020 to May 10, 2021



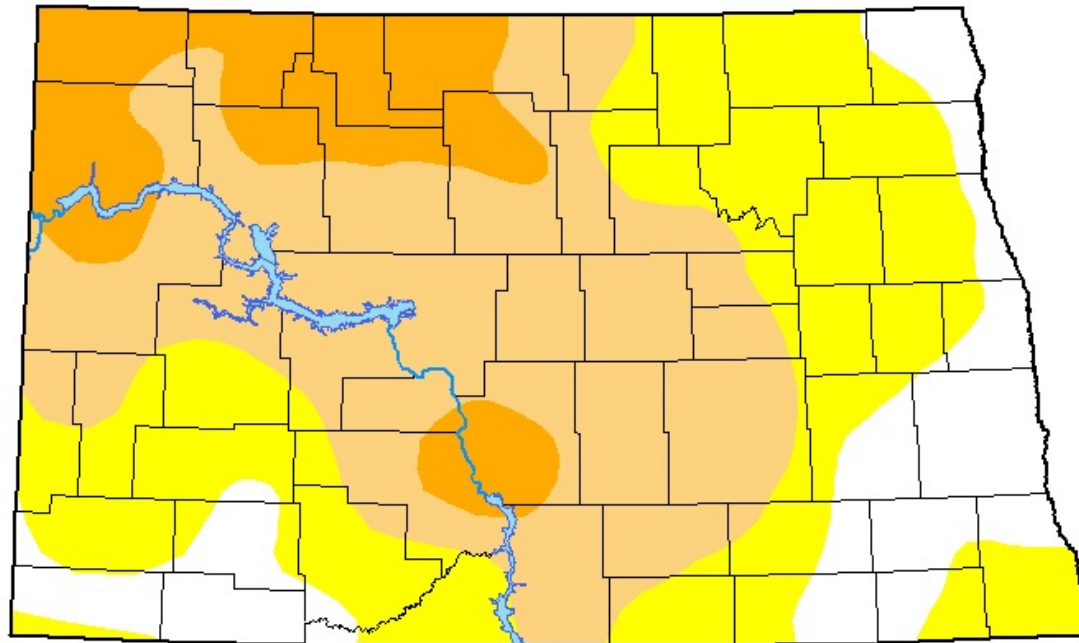
Mean period is 1991–2020.



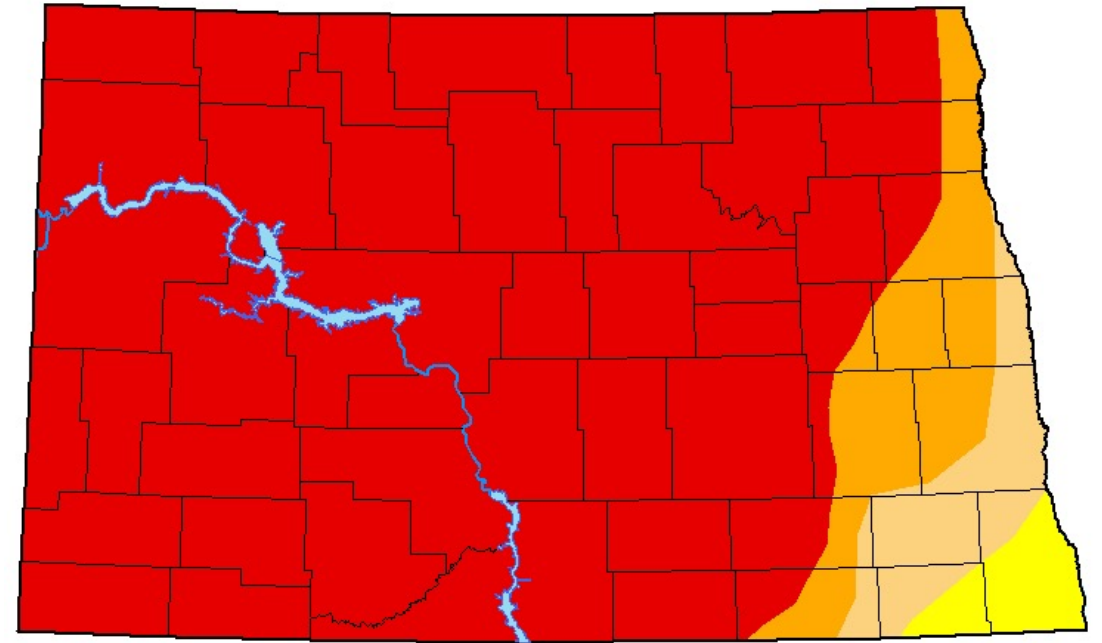


U.S. DROUGHT MONITOR

October 1, 2020



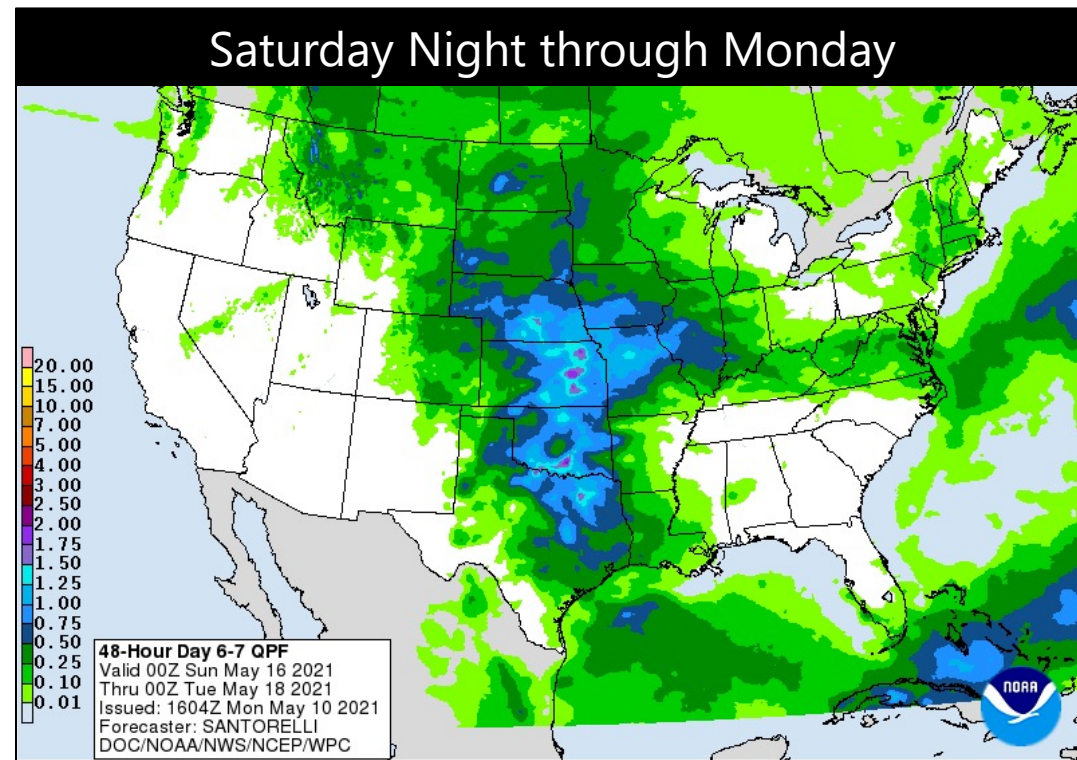
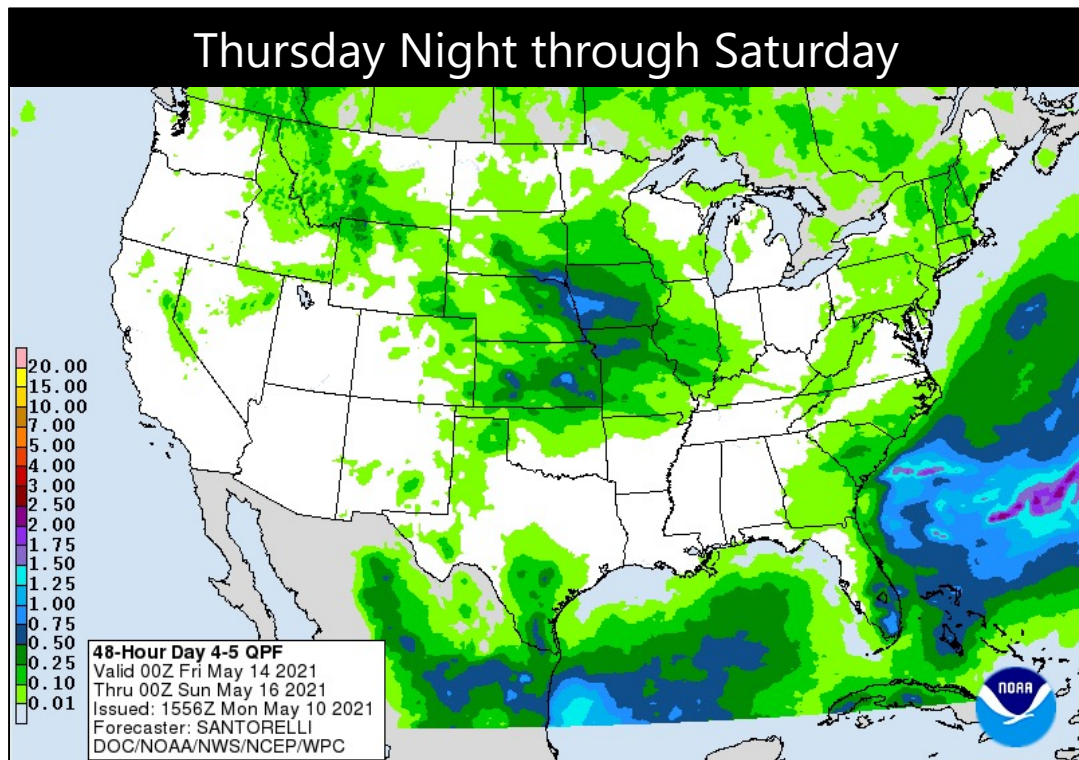
May 6, 2021





7-DAY FORECAST

- Quiet & Dry To End The Work Week With Warming Temperatures
- More Active Pattern Sets Up By The Weekend & Into Early Next Week
 - Several Chances For Rainfall But Low Confidence In Any Appreciable Amounts



* Forecast as of Monday afternoon

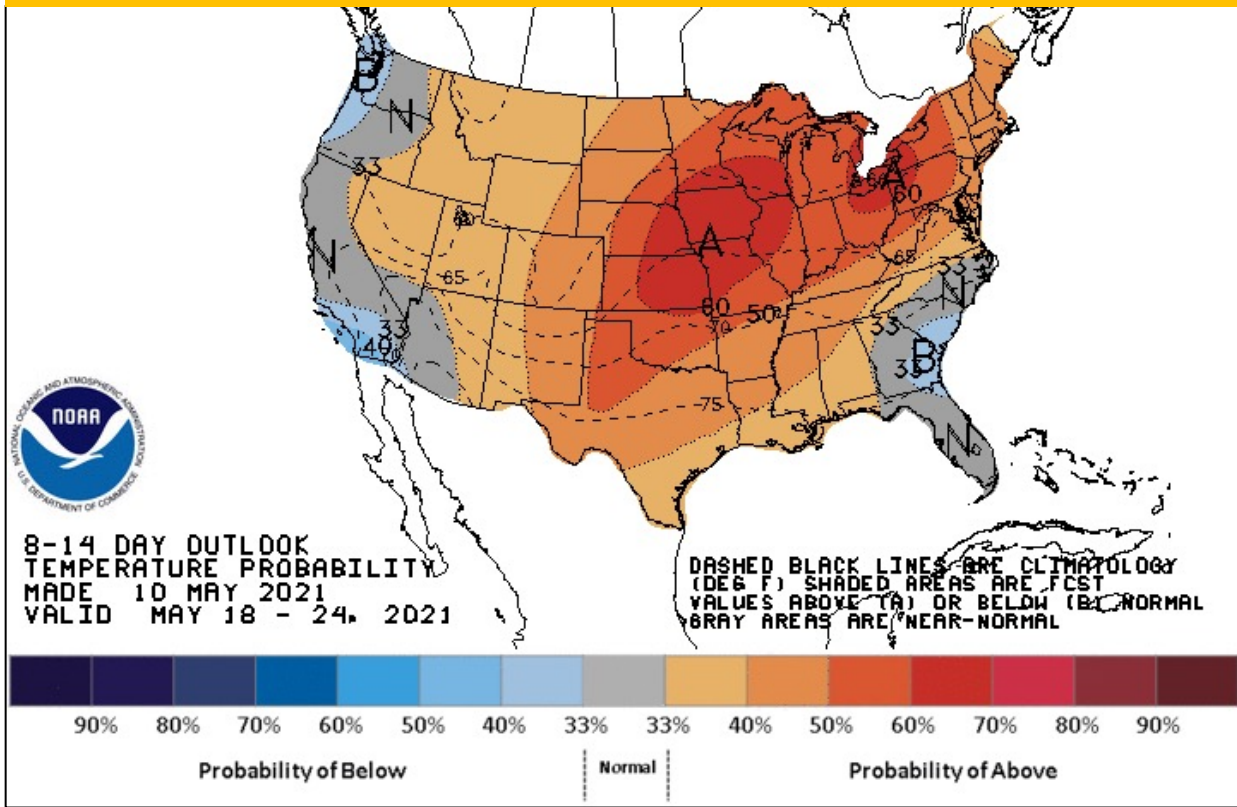
OVERVIEW

- Fall and Winter Review
- Upcoming Forecast/Climate Outlooks
- Lake Outlook
- Datum Change
- New Normals

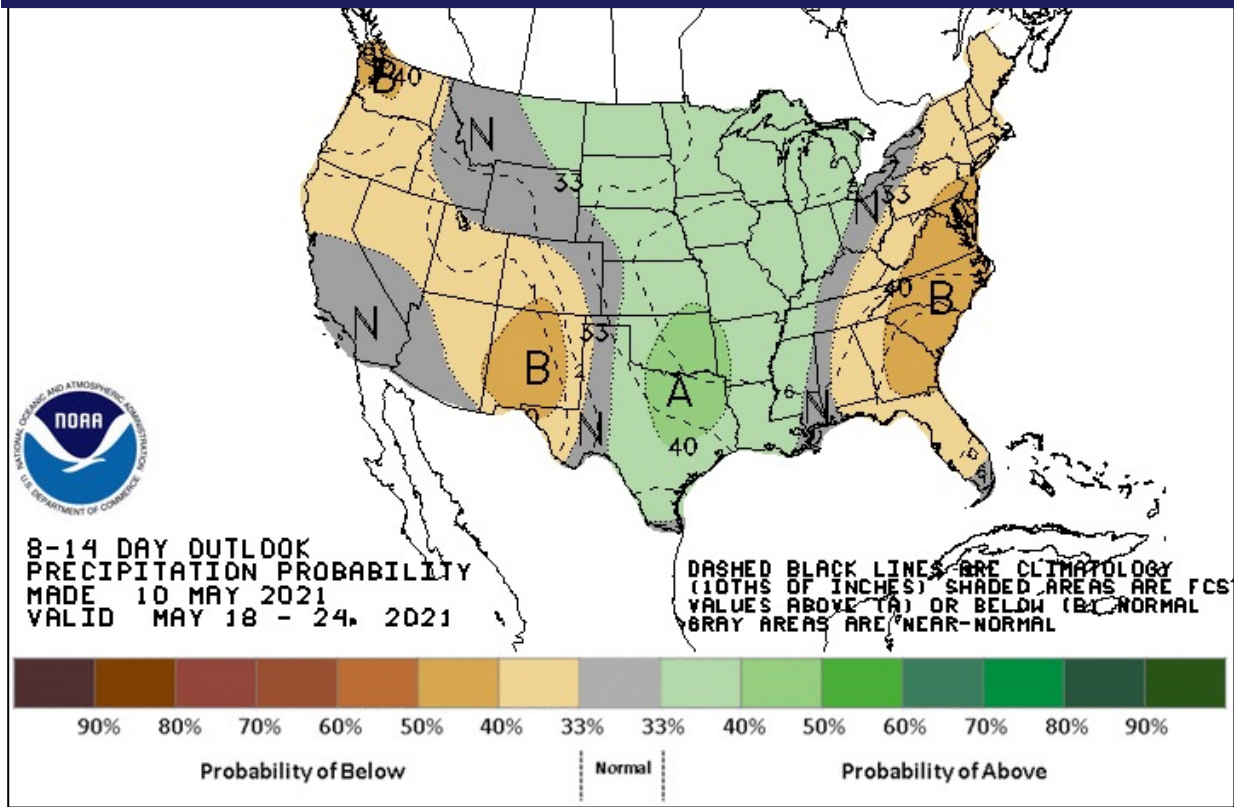


8-14 DAY OUTLOOK

Temperature



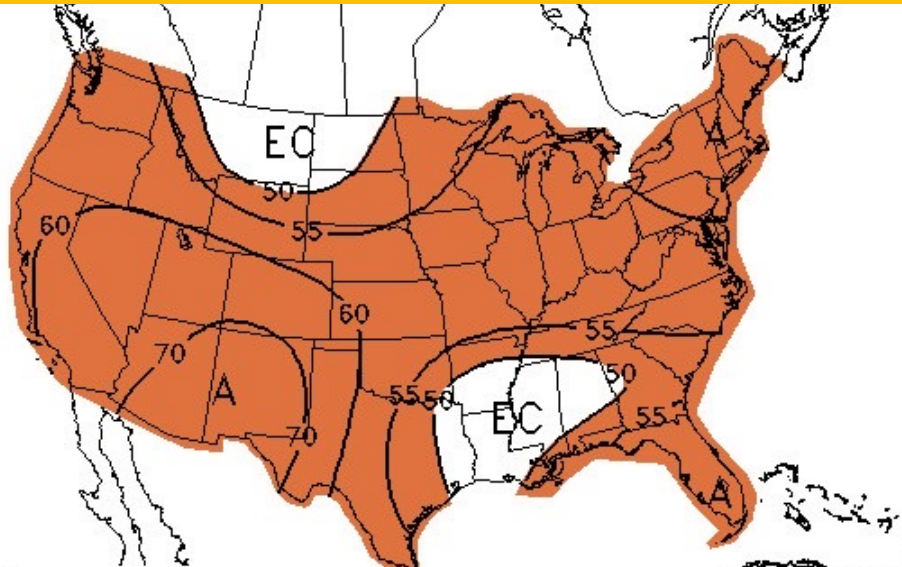
Precipitation





3-4 WEEK OUTLOOK

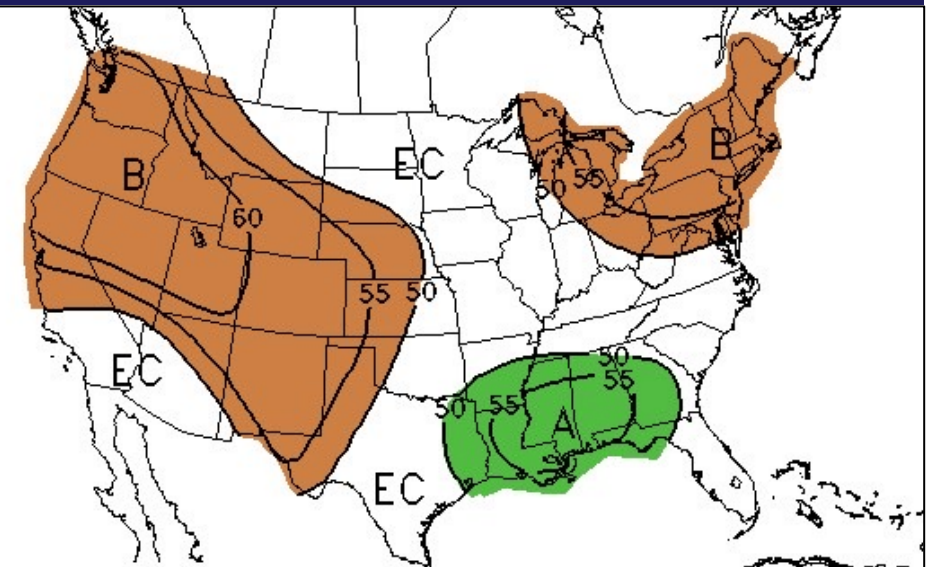
Temperature



WEEK 3-4 OUTLOOK
TEMPERATURE PROBABILITY
MADE 7 MAY 2021
VALID MAY 22 - JUN 04, 2021

EC MEANS 50/50 CHANCES
FOR ABOVE OR BELOW
A MEANS ABOVE NORMAL
B MEANS BELOW NORMAL

Precipitation



WEEK 3-4 EXPERIMENTAL OUTLOOK
PRECIPITATION PROBABILITY
MADE 7 MAY 2021
VALID MAY 22 - JUN 04, 2021

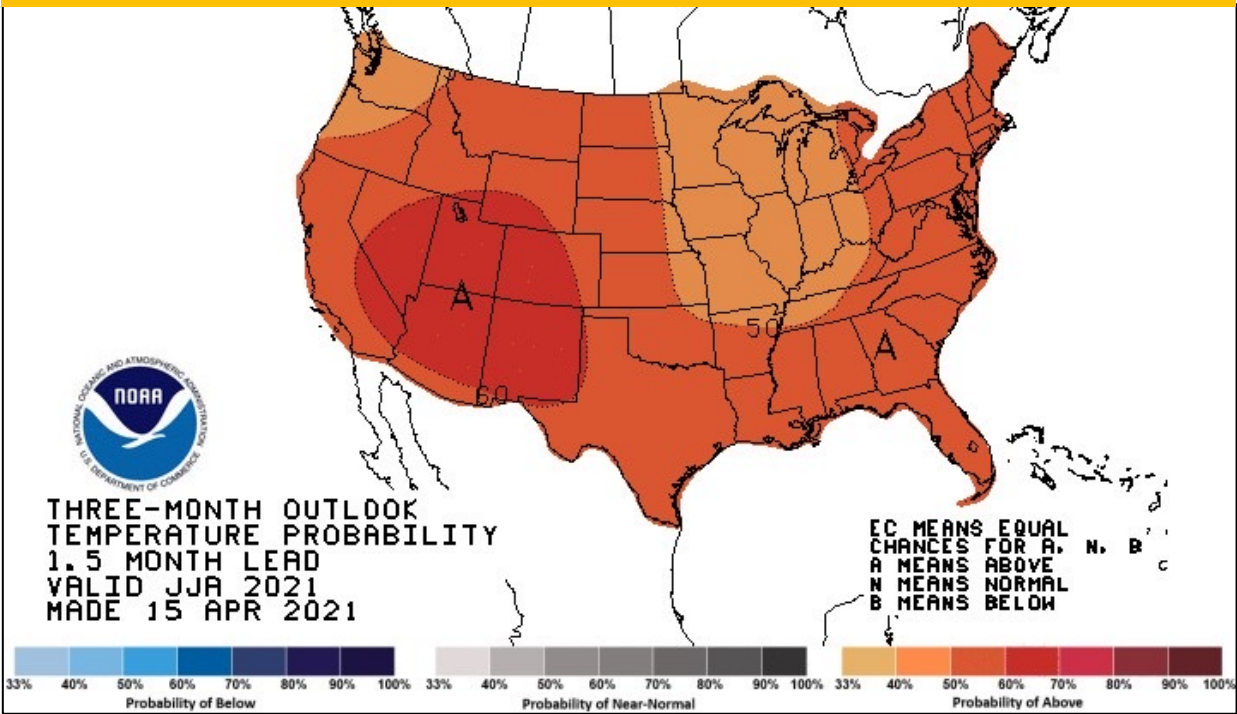
EC MEANS 50/50 CHANCES
FOR ABOVE OR BELOW
A MEANS ABOVE NORMAL
B MEANS BELOW NORMAL



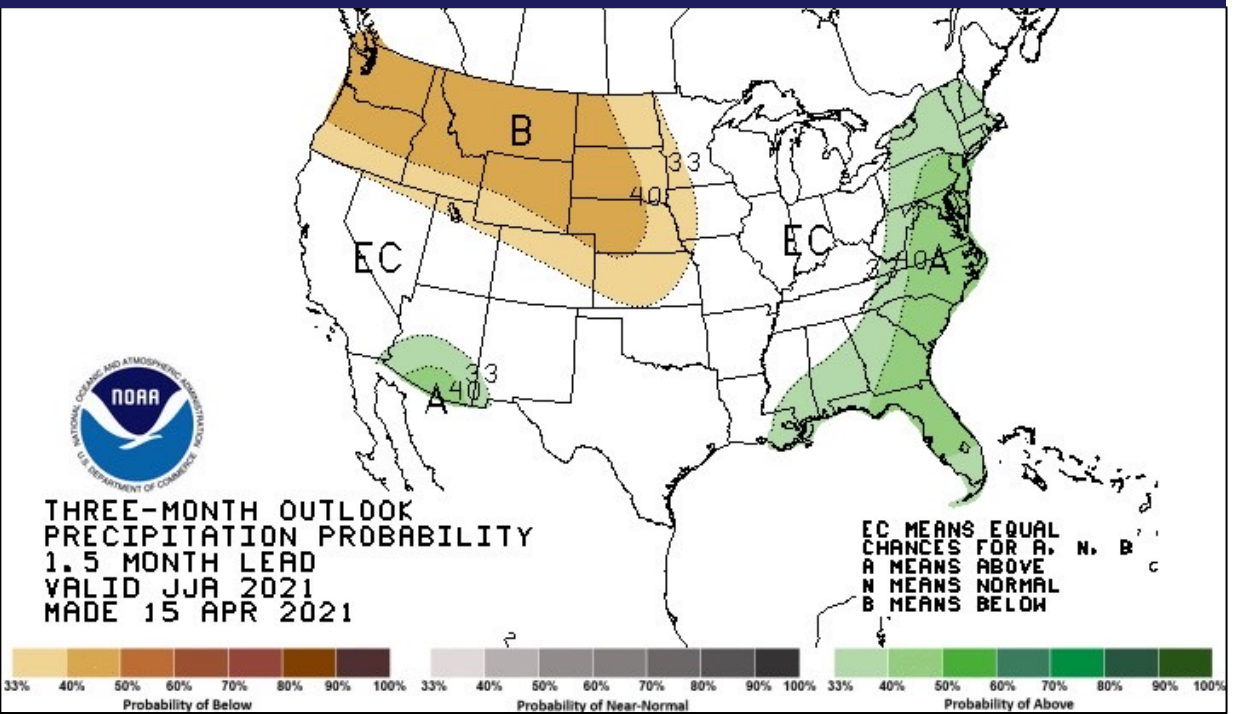
SUMMER OUTLOOK

(June, July, and August)

Temperature



Precipitation

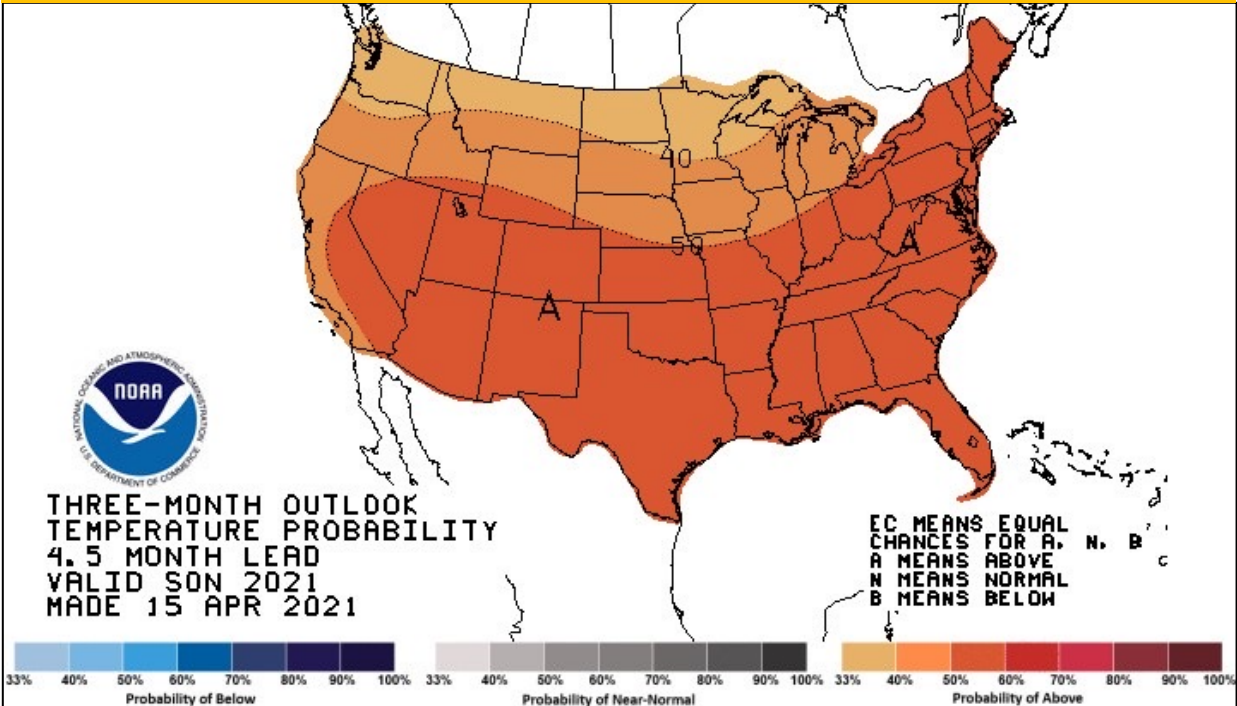




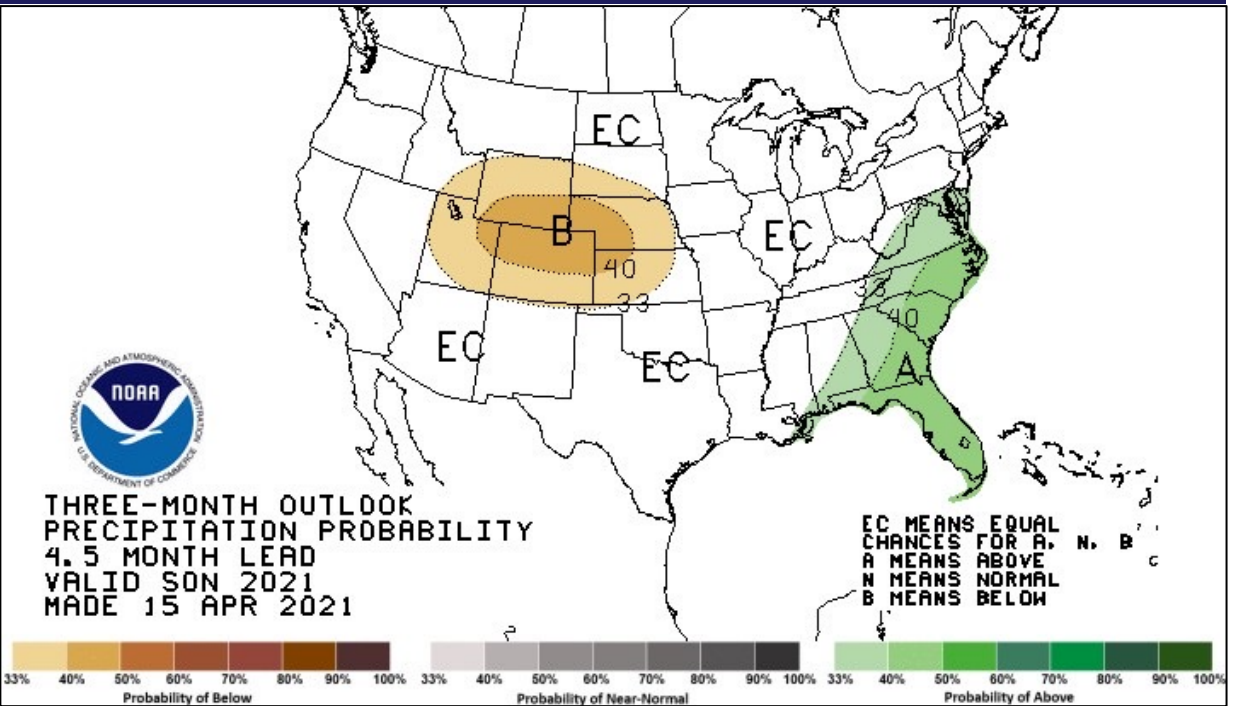
FALL OUTLOOK

(September, October, and November)

Temperature



Precipitation



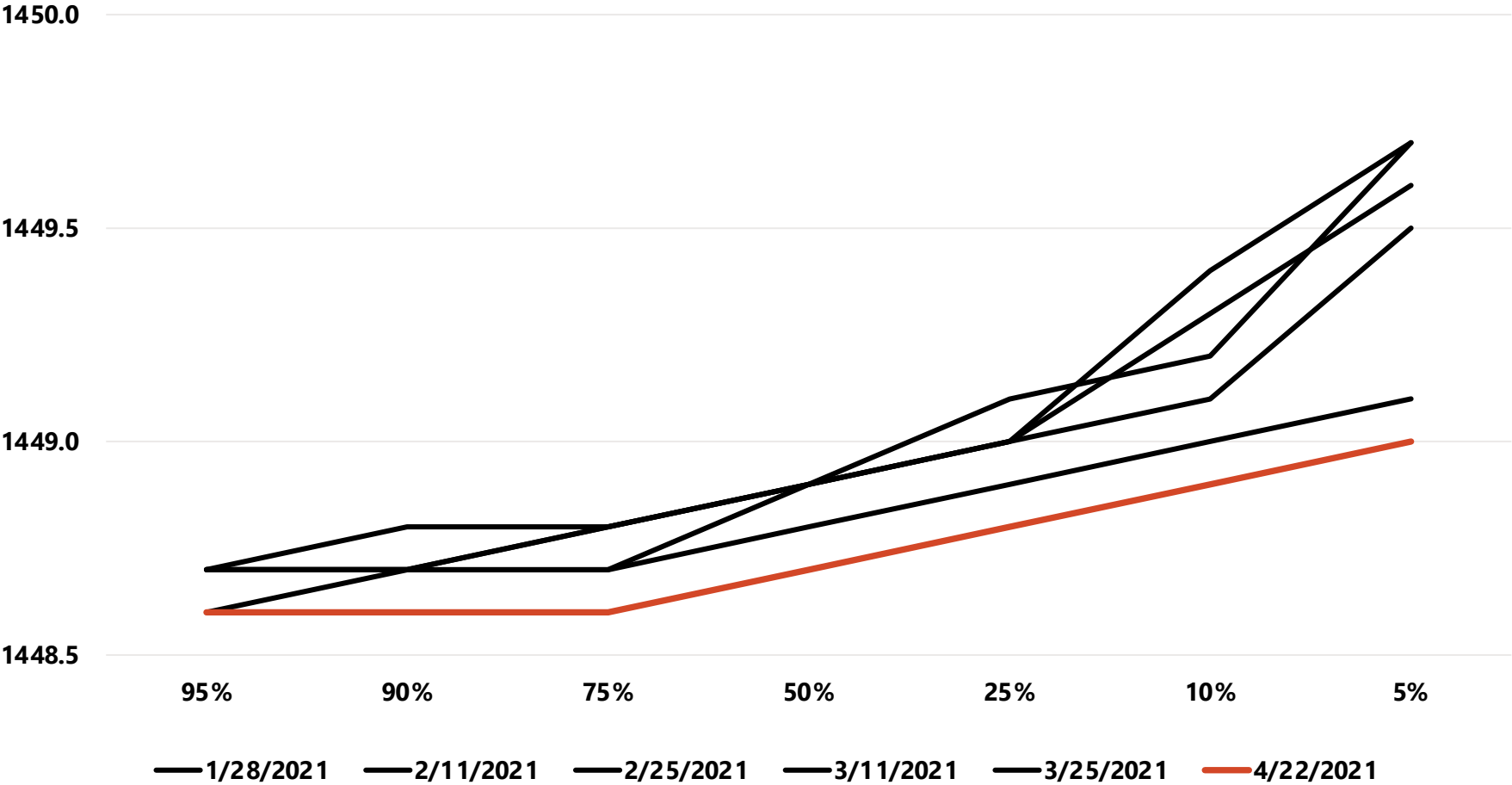
OVERVIEW

- Fall and Winter Review
- Upcoming Forecast/Climate Outlooks
- Lake Outlook
- Datum Change
- New Normals



OUTLOOK PROBABILITIES

2021 Devils Lake Outlooks



Current Lake Level

Creel Bay
1448.31 ft (5/10)

Stump Lake
1448.25 ft (5/10)

Next Outlook

Thursday,
May 27, 2021

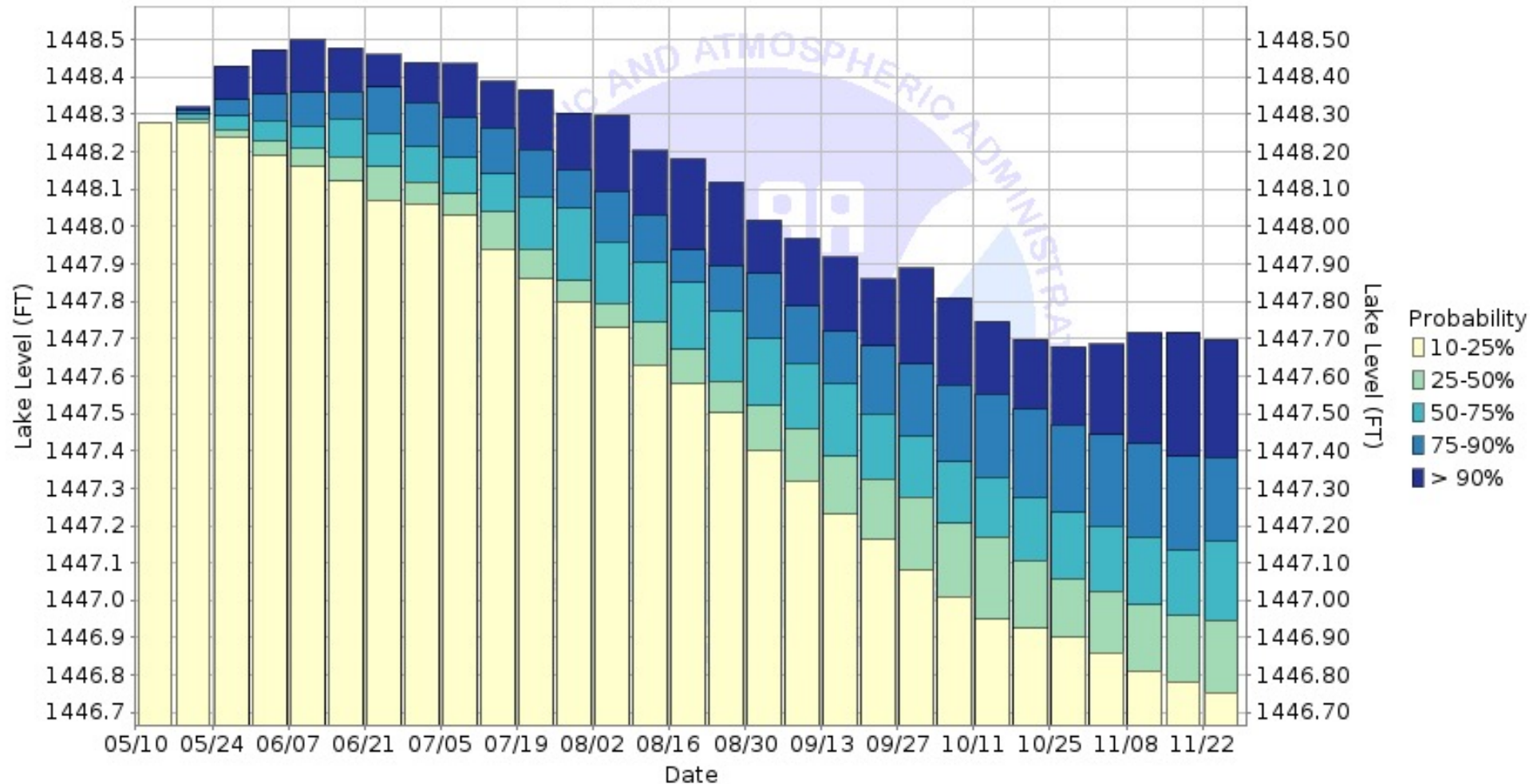
First Non-Exceedance Outlook

Thursday,
June 24, 2021



LAKE FORECAST (NO PUMPING)

Weekly Chance of Minimum Lake Levels at DCBN8
Forecast for the period 05/10/2021 - 11/30/2021
This is a conditional simulation based on the conditions as of 05/10/2021
No pumping is considered in the simulation



OVERVIEW

- Fall and Winter Review
- Forecast and Climate Outlooks
- Lake Outlook
- Datum Change
- New Normals



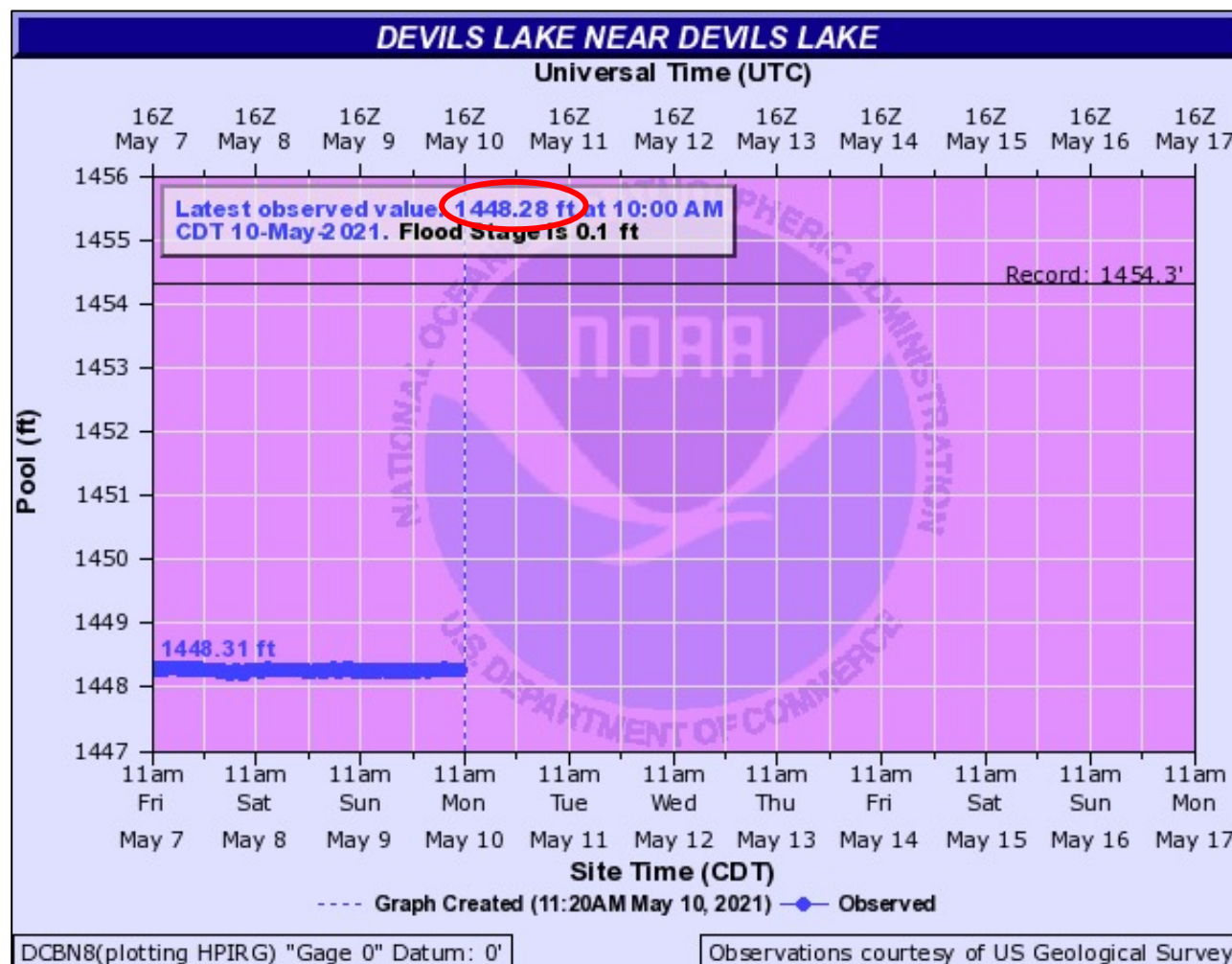
DATUM CHANGE

- USGS Has Converted The "Gage Zero Datum" For The Creel Bay & Stump Lake Gages From The Older NGVD29 Datum To The More Recent NAVD88 Datum
- Creel Bay (DCBN8)
 - 1400.00 Ft NGVD29
 - 1401.19 Ft NAVD88
- Stump Lake (ESLN8)
 - 1400.00 Ft NGVD29
 - 1401.15 Ft NAVD88



SO WHAT DOES THIS MEAN?

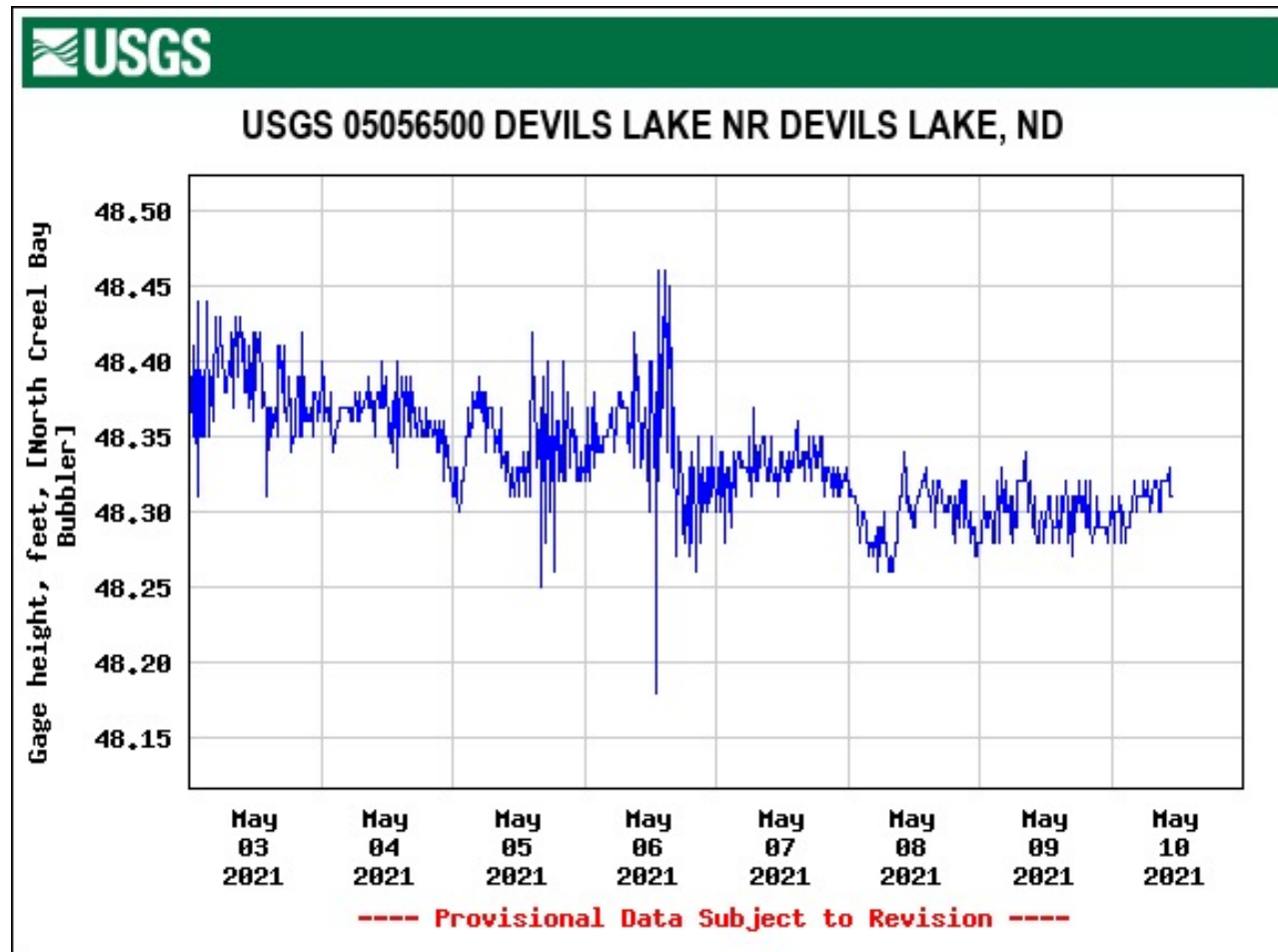
- This Change Shouldn't Affect Most Users Of The Data
- However, It Will Require A Change In How The NWS Displays The Data (From The USGS)
- 1448.28 Ft Will Soon Be Displayed As 48.28 Ft (i.e., The User Will Need To Add 1400.00 Ft To Get The Elevation They Are Used To)





SO WHAT DOES THIS MEAN?

- Users Of The Data Directly From The USGS Website Will See No Change In How The Data Are Displayed



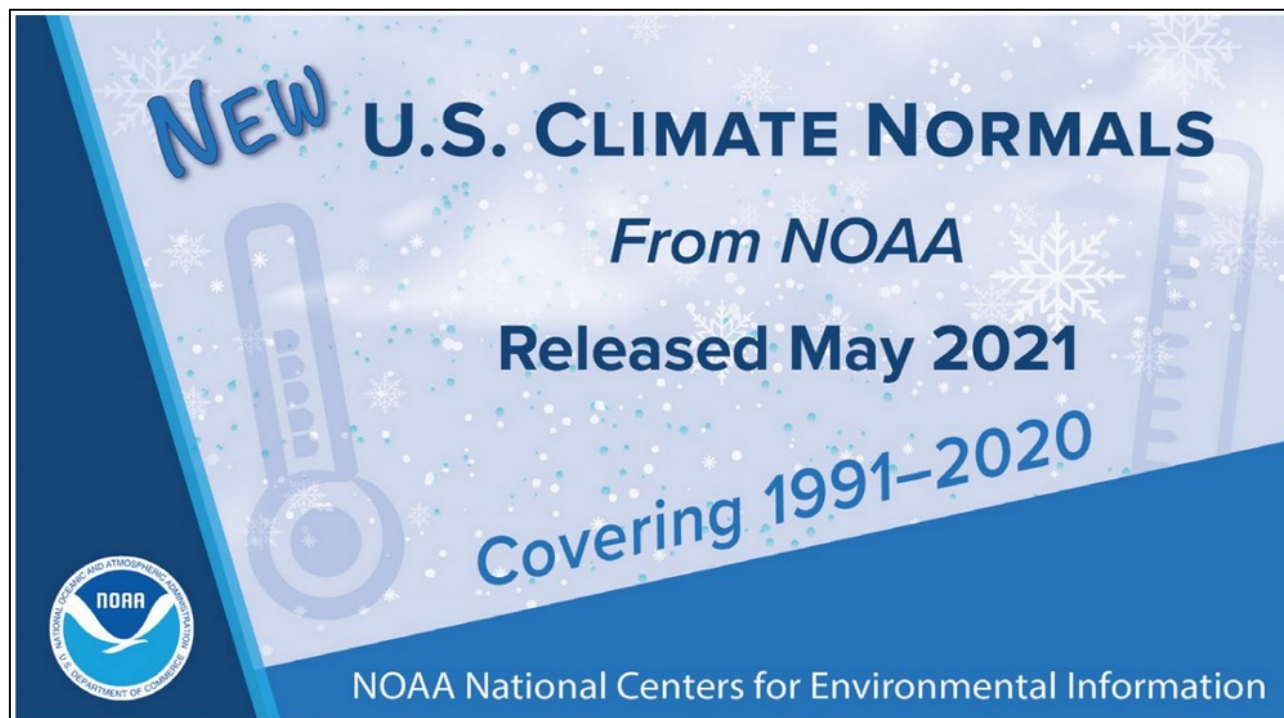
OVERVIEW

- Fall and Winter Review
- Upcoming Forecast/Climate Outlooks
- Lake Outlook
- Datum Change
- New Normals



NEW NORMALS

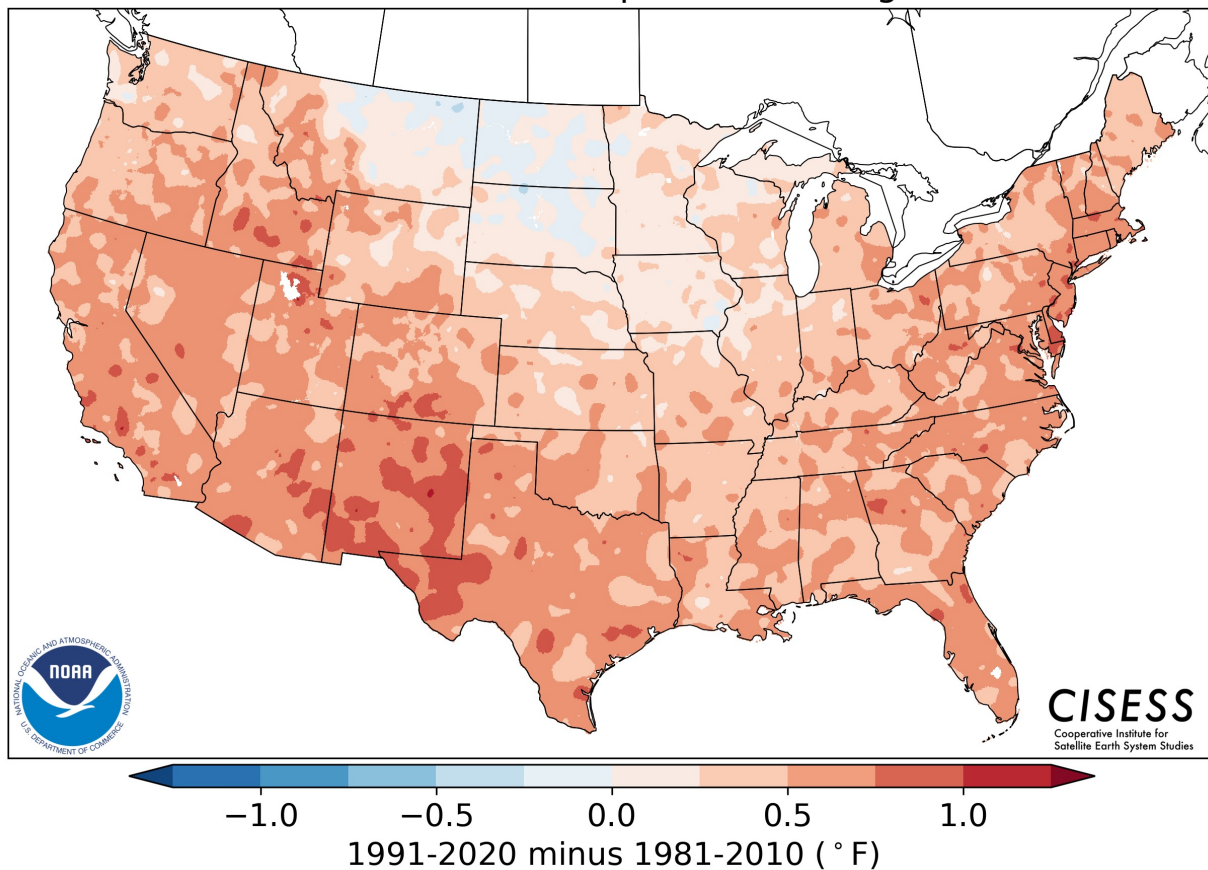
- NOAA Recently Released The New 30-Year Normals For The U.S.
 - Previous Normals Encompassed The Years 1981-2010
 - New Normals Encompass 1991-2020



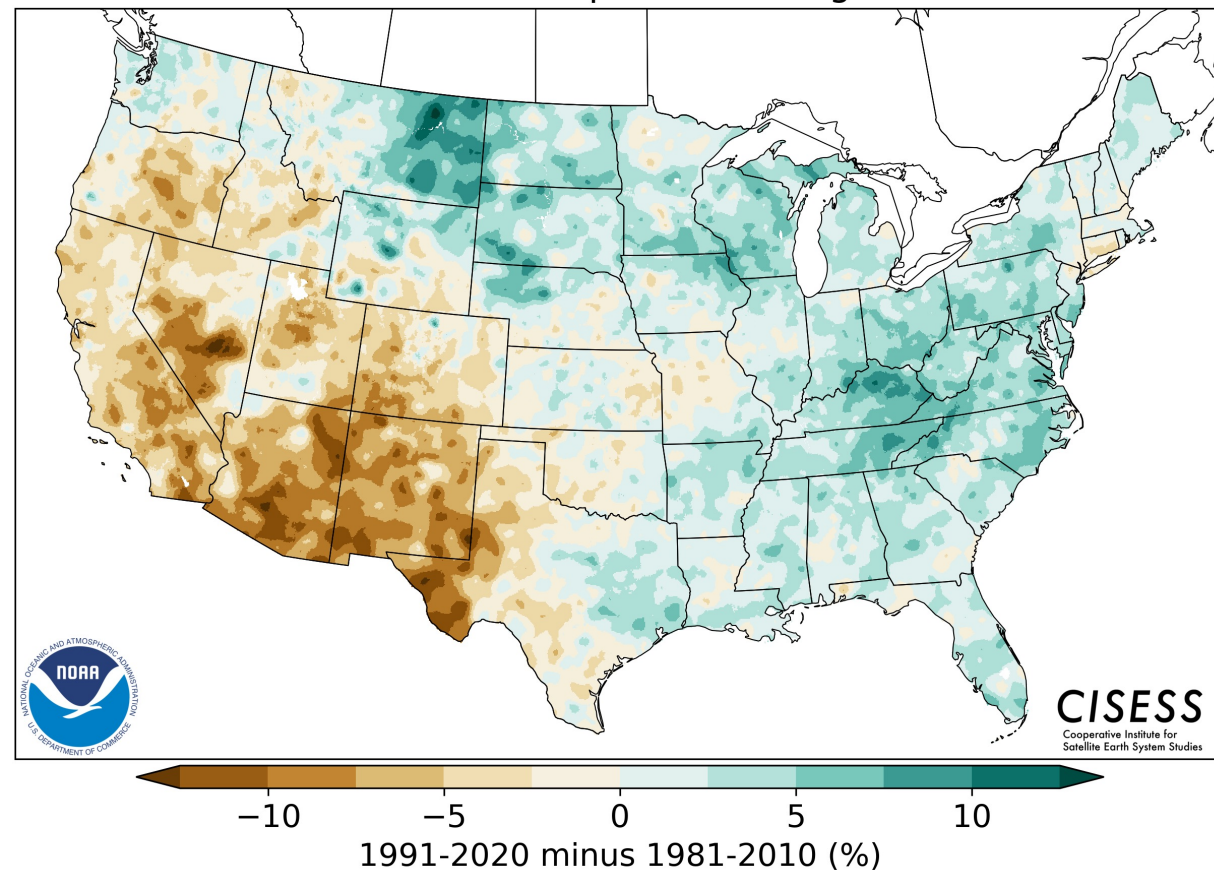


DIFFERENCE BETWEEN NEW AND OLD

Annual Mean Temperature Change



Annual Precipitation Change





LOCAL DIFFERENCES

Devils Lake*	1981-2010	1991-2020	Difference
Maximum Temp	50.2	49.8	-0.4
Minimum Temp	31.7	30.6	-1.1
Average Temp	41.0	40.2	-0.8
Precipitation	20.42	19.98	-0.44

Minot	1981-2010	1991-2020	Difference
Maximum Temp	52.5	54.7	+2.2
Minimum Temp	31.7	32.1	+0.4
Average Temp	42.1	43.4	+1.3
Precipitation	18.59	19.28	+0.69

Grand Forks	1981-2010	1991-2020	Difference
Maximum Temp	51.2	50.2	-1.0
Minimum Temp	30.8	30.9	+0.1
Average Temp	41.0	40.6	-0.4
Precipitation	21.62	22.84	+1.22

Bismarck	1981-2010	1991-2020	Difference
Maximum Temp	55.0	55.1	+0.1
Minimum Temp	30.9	31.1	+0.2
Average Temp	43.0	43.1	+0.1
Precipitation	17.85	19.05	+1.20

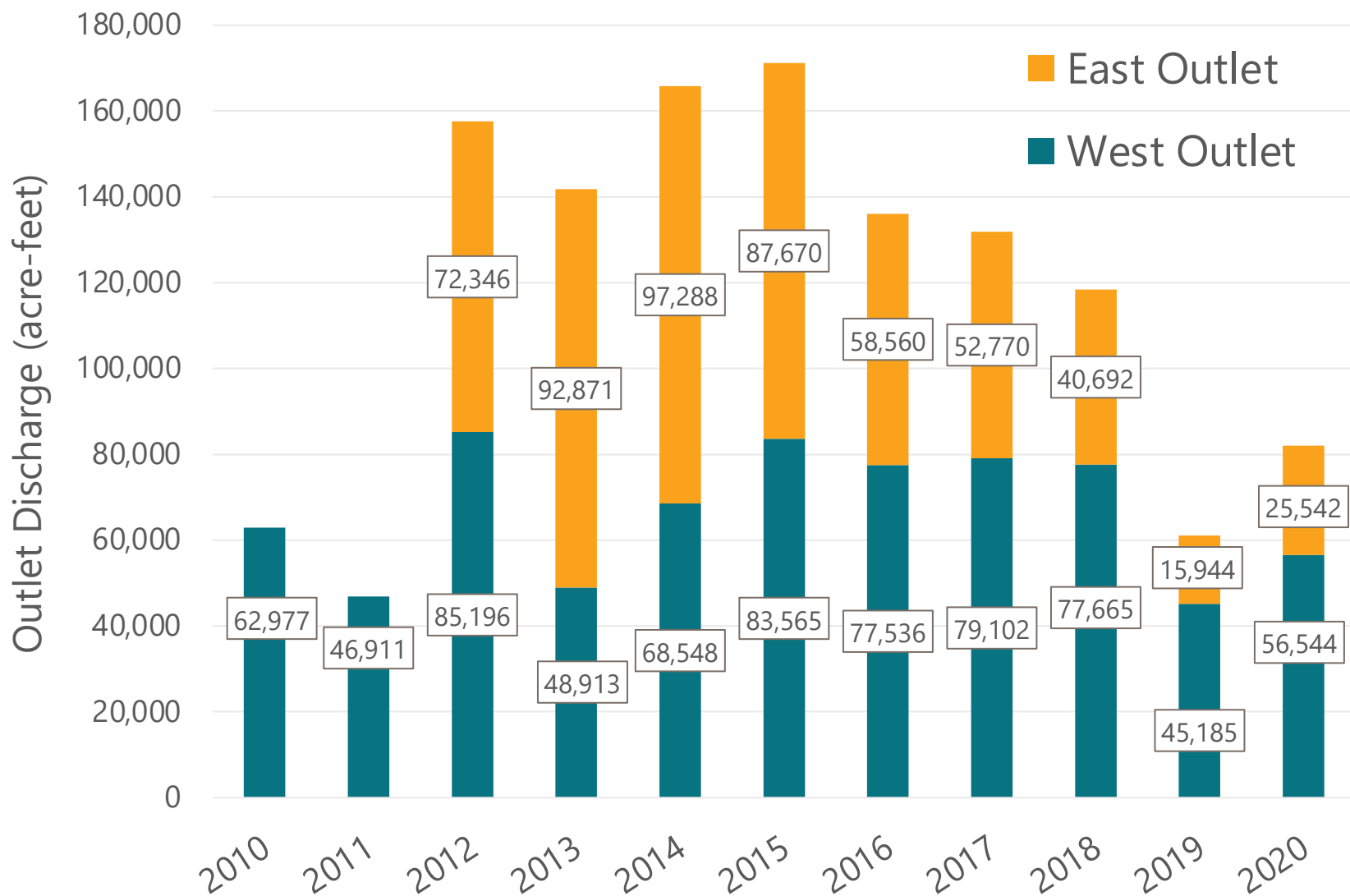
Fargo	1981-2010	1991-2020	Difference
Maximum Temp	52.7	52.6	-0.1
Minimum Temp	32.0	31.9	-0.1
Average Temp	42.4	42.2	-0.2
Precipitation	22.58	23.95	+1.37

* Mixture of KDLR radio and DVL airport reports; likely incomplete dataset

2020 OPERATIONAL SUMMARY

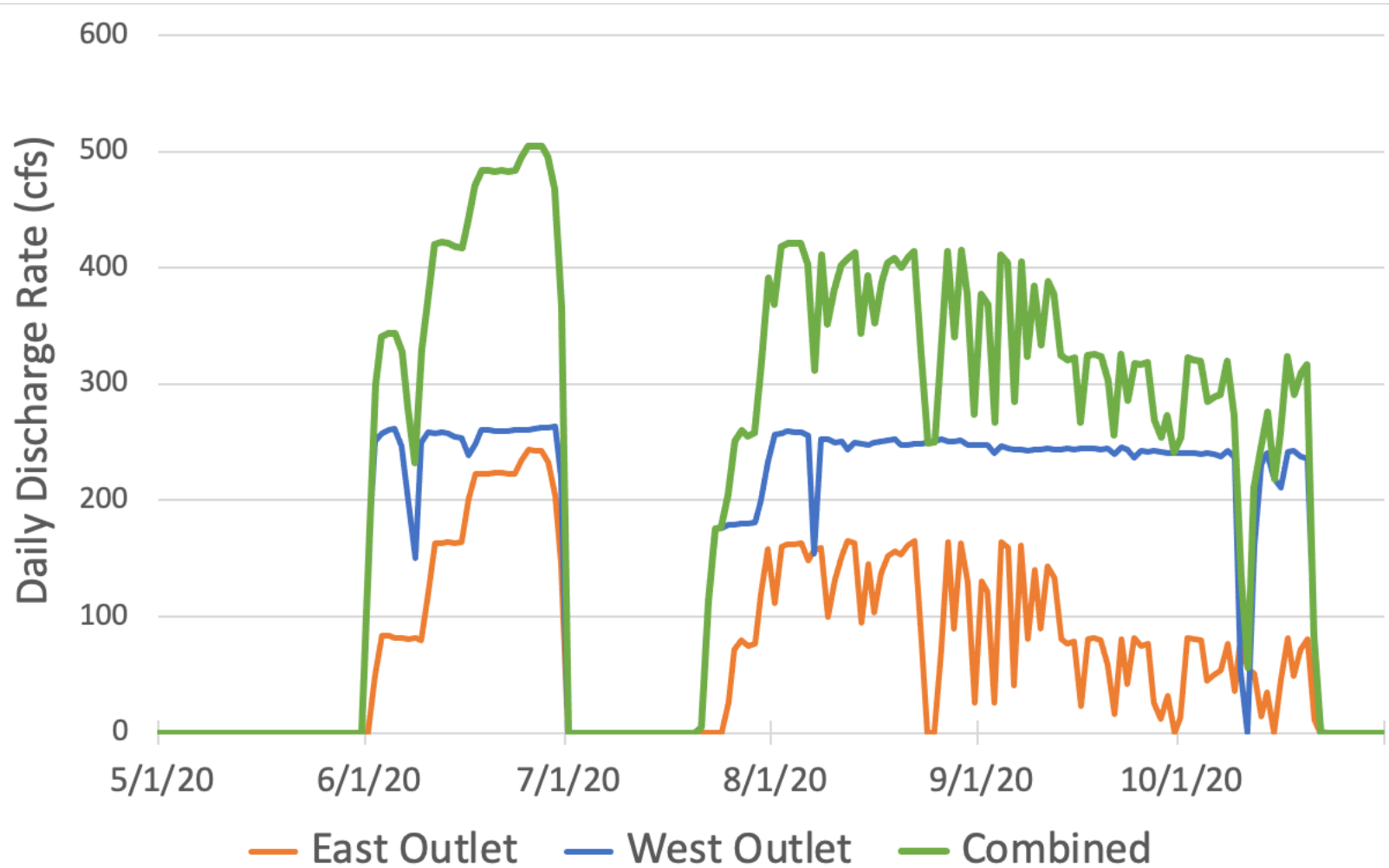


DEVILS LAKE OUTLET DISCHARGE 2010 – 2020



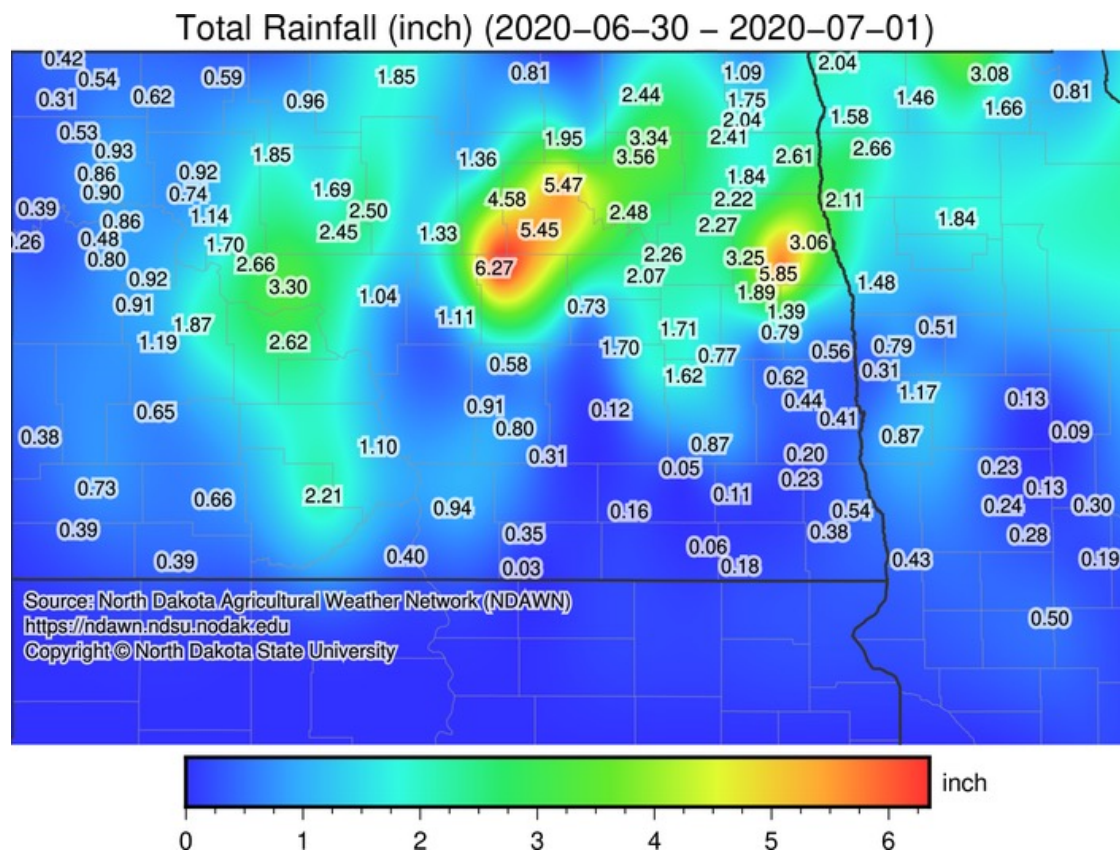
- 2020 Total Discharge Was 82,086 Acre-Feet
- Outlets Discharged For 124 Days In 2020
- The Outlets Have Combined To Discharge Over 1.3M Ac-Ft
- Estimated Lake Elevation is 5.5 feet Higher Without Outlets

2020 OUTLET DISCHARGE RATE



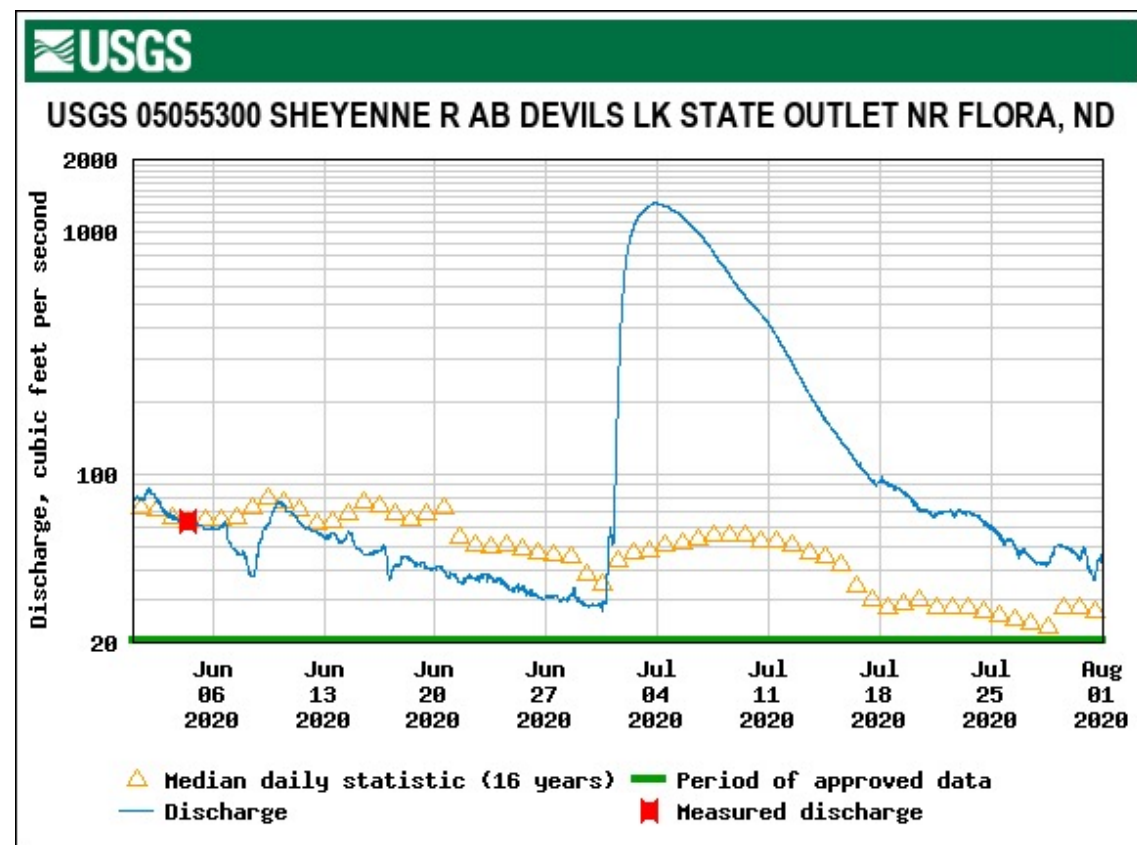
- 2020 Operation Window Was June 1 to October 21
- Both Outlets Were Shut Down For 3 Weeks In July
- Wind Conditions Caused Unsteady East Outlet Operation
- West Outlet Discharge Was 69% Of The Total

JULY 2020 SHUTDOWN

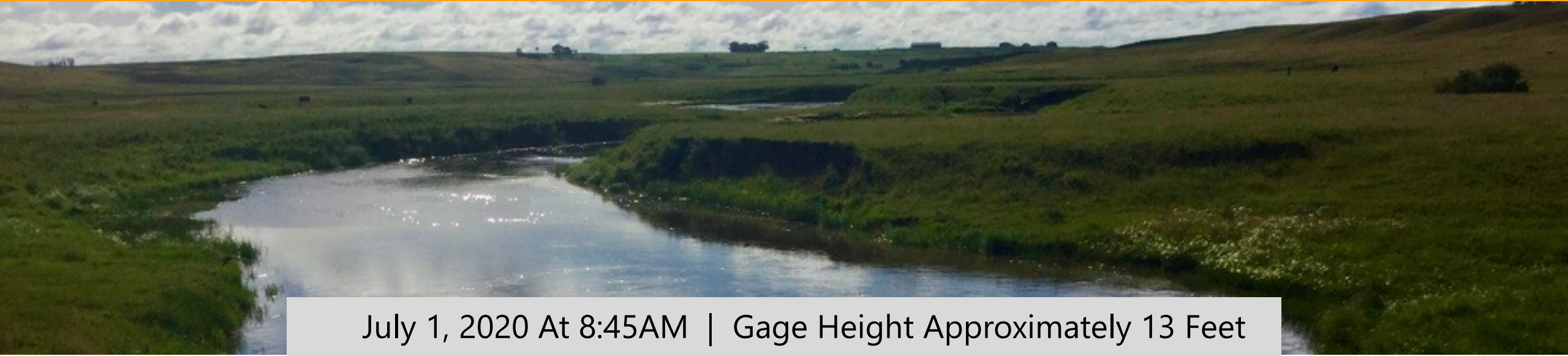


NDAWN Total Rainfall From
June 30 & July 1
6.27 Inches Measured At Harvey

The Hydrograph Below Shows The
Sheyenne River Response At Flora



FLORA FLOW COMPARISON



July 1, 2020 At 8:45AM | Gage Height Approximately 13 Feet



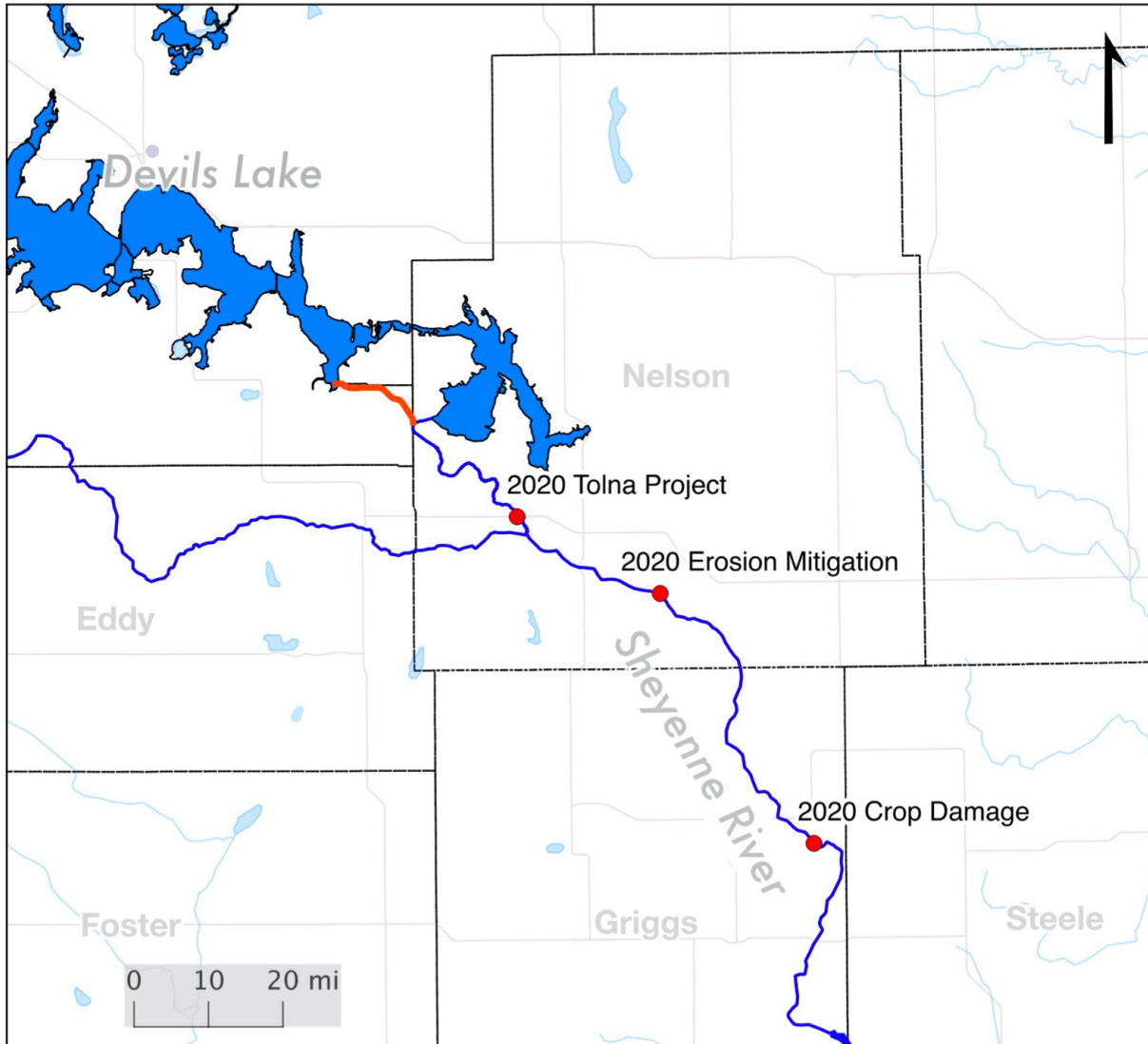
July 2, 2020 At 10:20AM | Gage Height Approximately 19.7 Feet

OUTLET MAINTENANCE AND MITIGATION



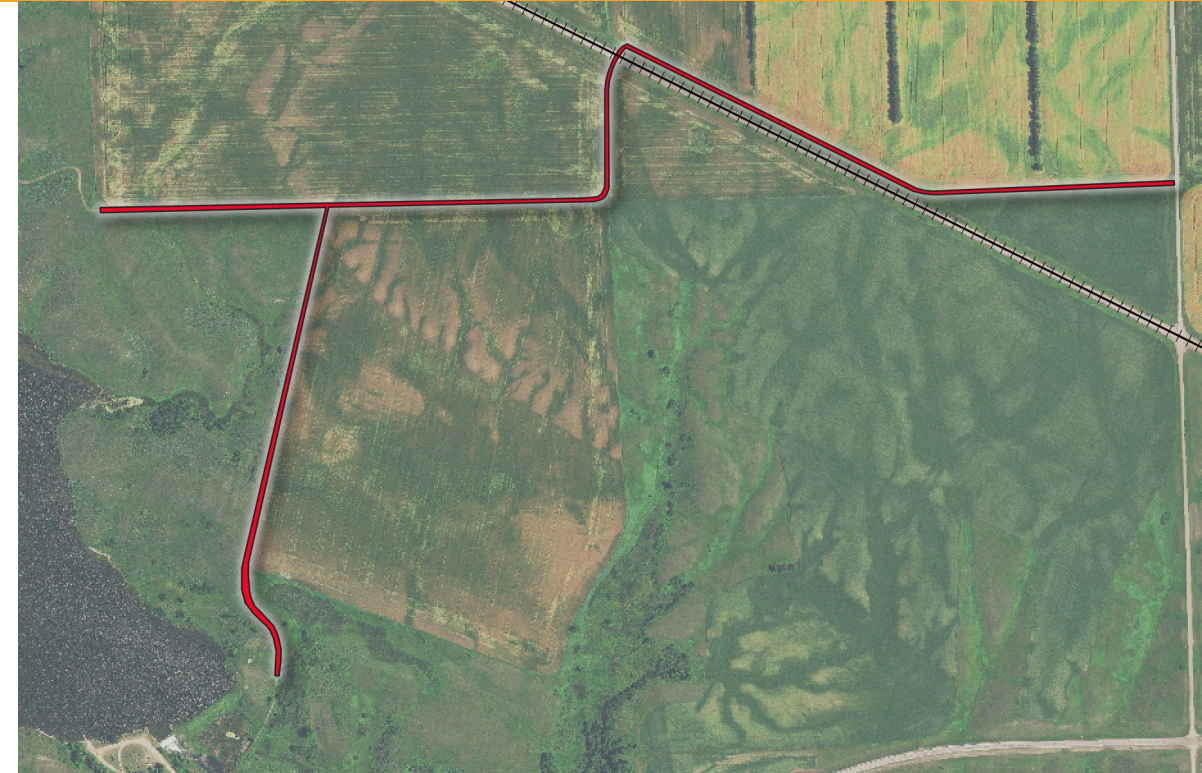
- Continued Communication & Review Of Potential Outlet Mitigation Projects
- Continued Outlet Maintenance Including Weed Control, Erosion Stabilization, Re-Coating, & Component Testing

2020 DOWNSTREAM COST-SHARE



- Three Cost-Share Applications For Downstream Impacts Were Received and Approved In 2020
- Two Projects In Nelson County Were Related To Long-Term Erosion
- Approval For Griggs County Crop Damage Was For Documented Impact To 45 Acres Of Soybeans In July 2020

TOLNA DAM BRIDGE REMOVAL



In August 2020, the SWC, Nelson County WRD, & DLJWRB Collaborated To Improve Access & Eliminate A Hazard At Tolna Dam

2020 WATER QUALITY REVIEW



DEVILS LAKE OUTLET WATER QUALITY MONITORING

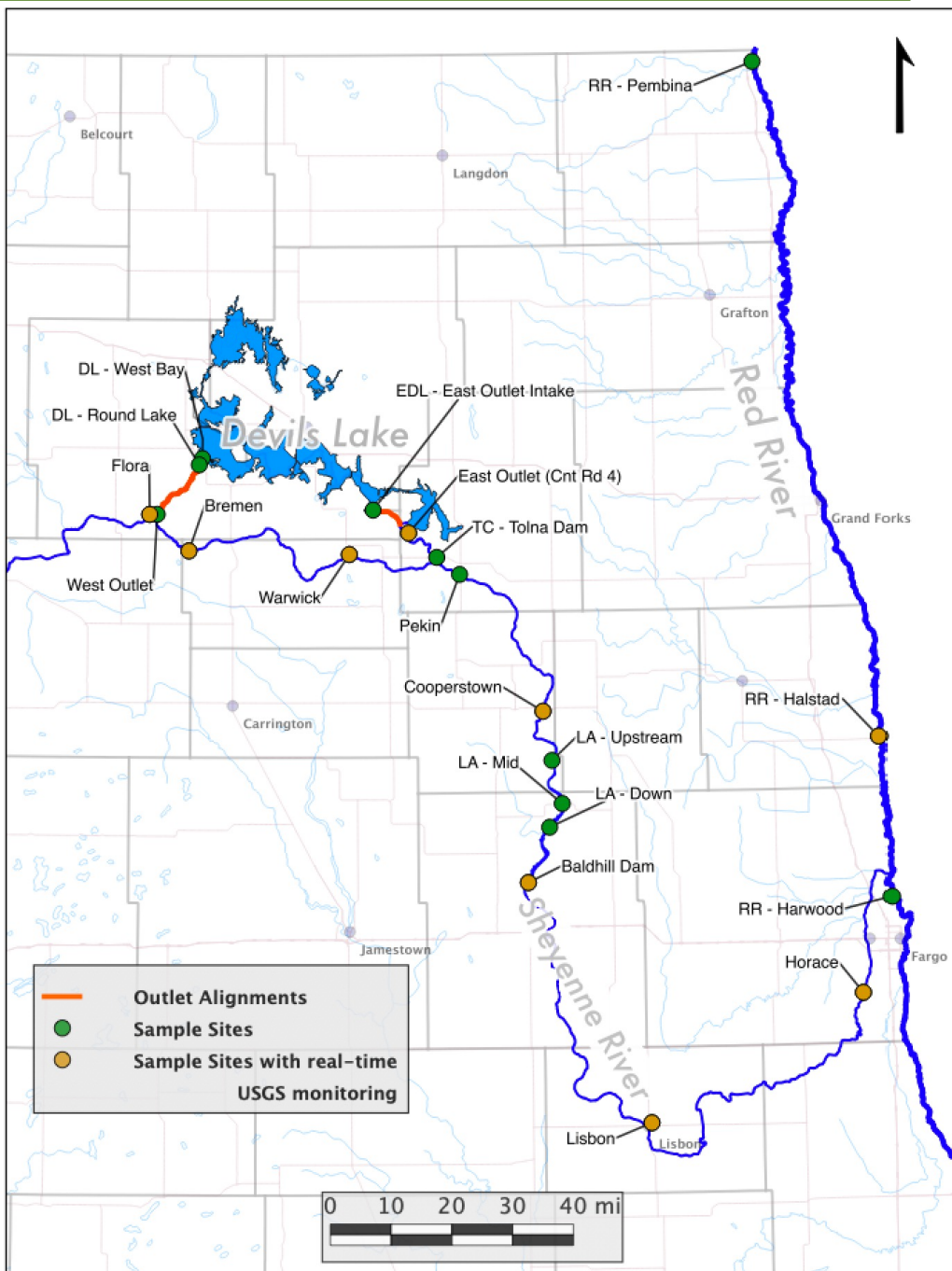
Outlet Discharge Is Monitored Throughout
The Sheyenne & Red Rivers

Average Of 537 Water Quality Samples
Per Year From 2012 - 2019

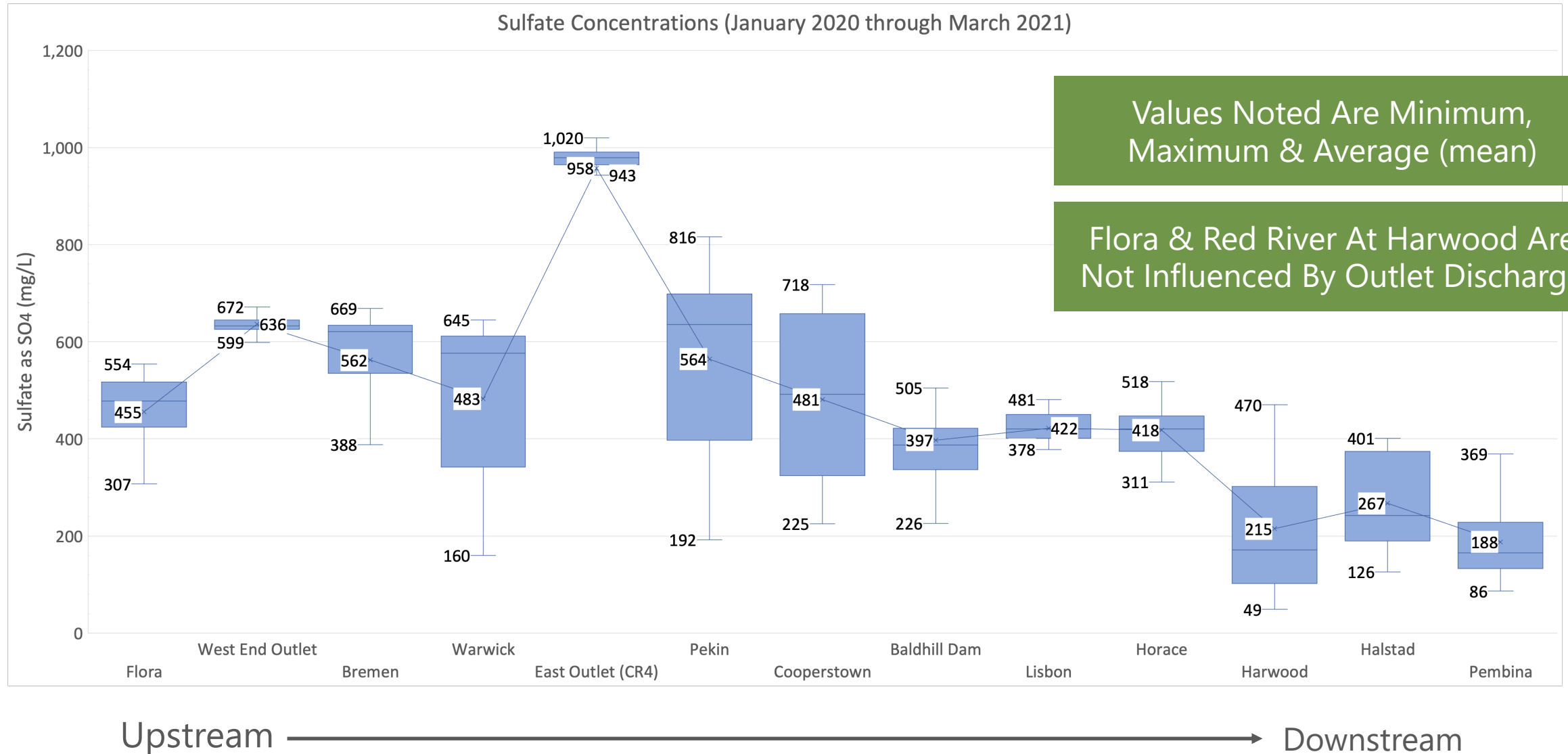
453 Samples Collected In 2020 Reflects
Shorter Operating Season

Majority Of The Samples Are Collected By
Garrison Diversion Conservancy District Staff

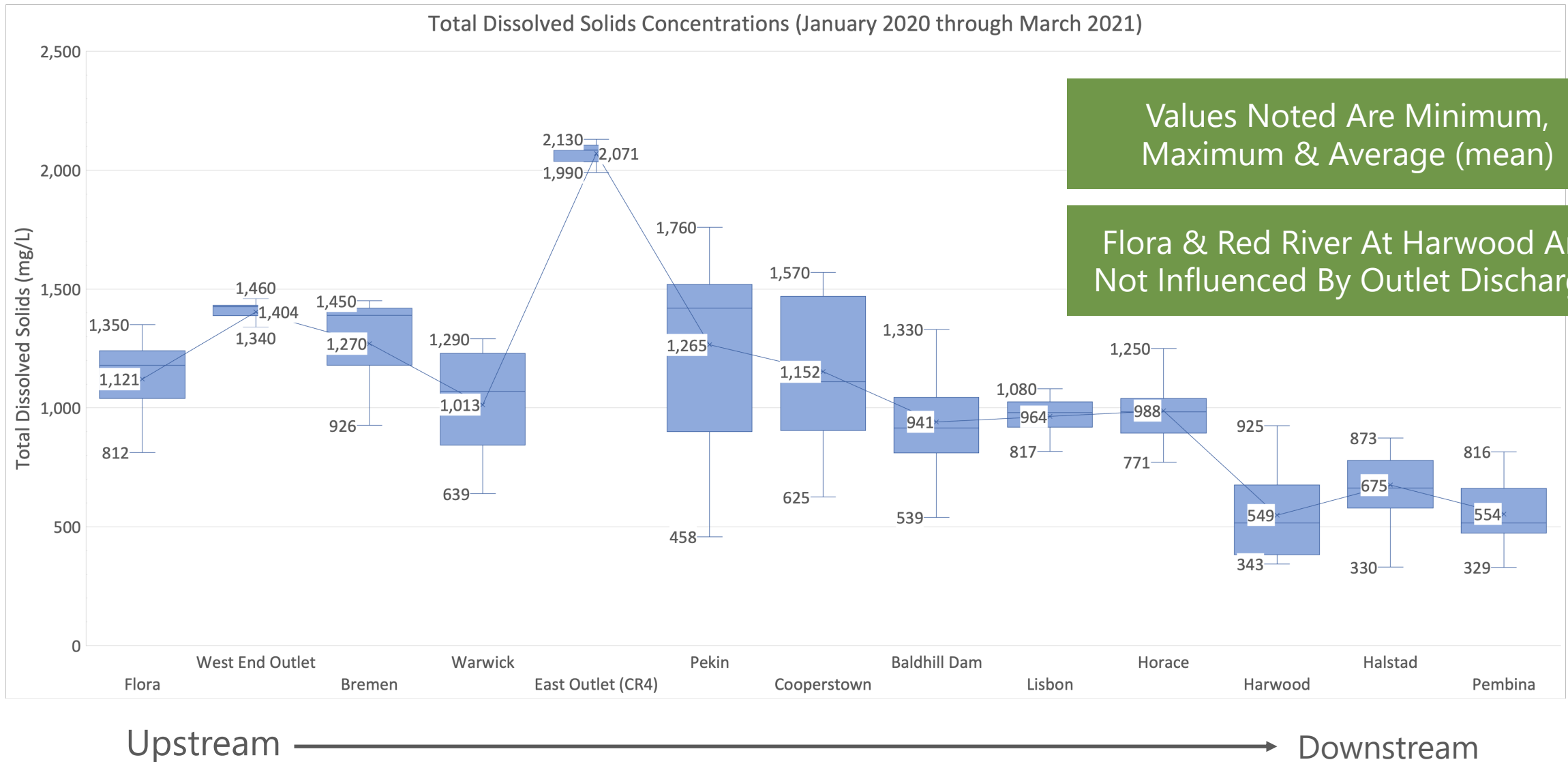
SWC & USGS Staff Also Collect Samples



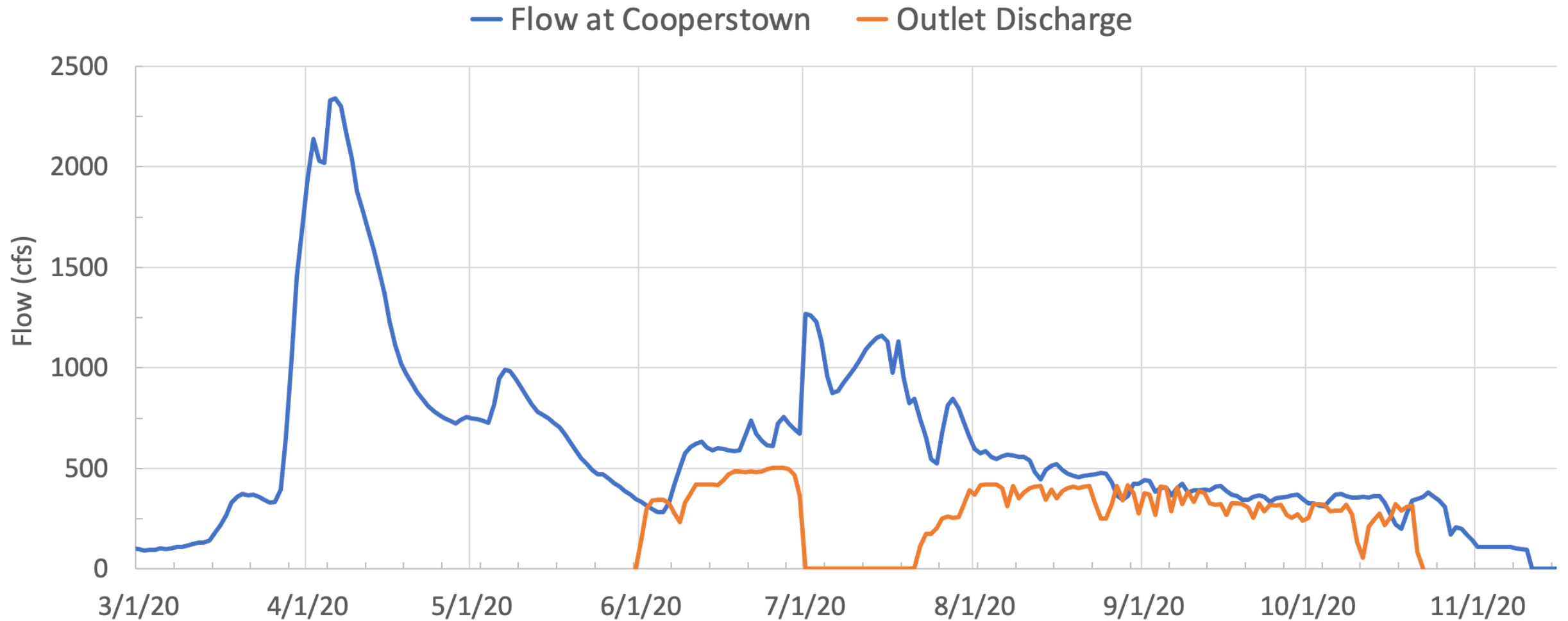
SULFATE MONITORING



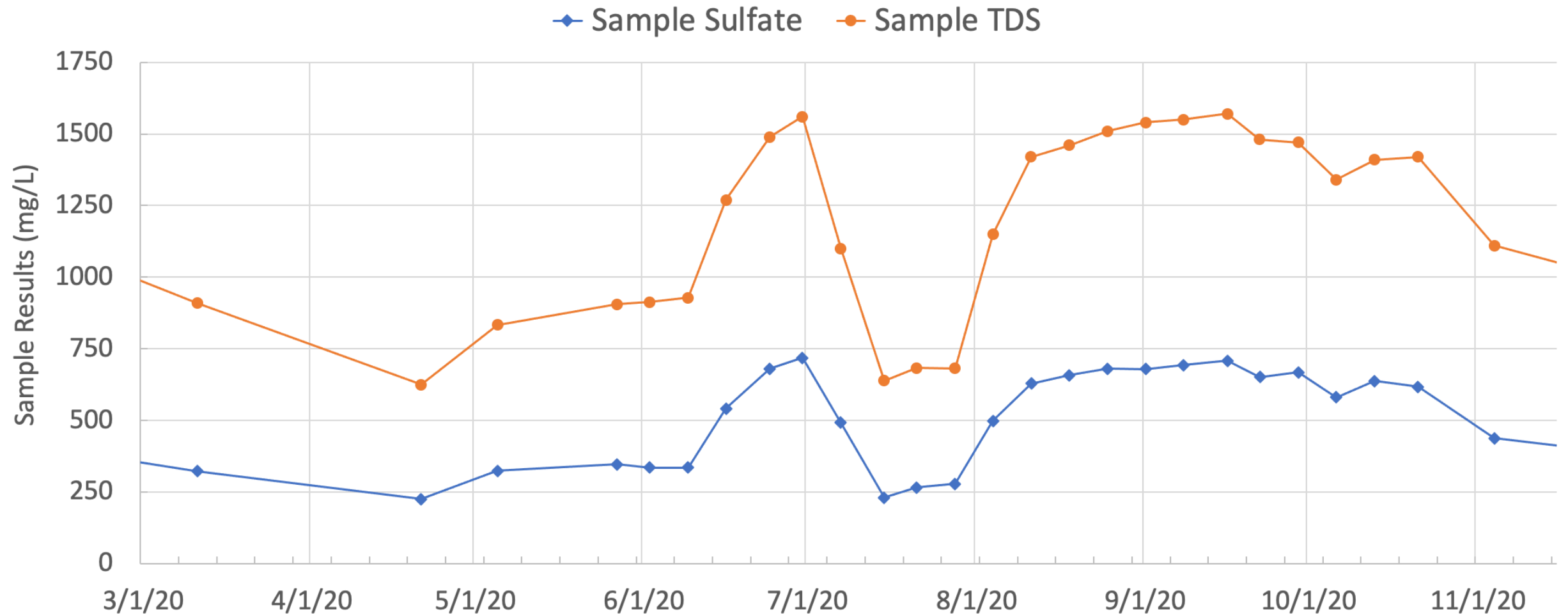
TOTAL DISSOLVED SOLIDS MONITORING



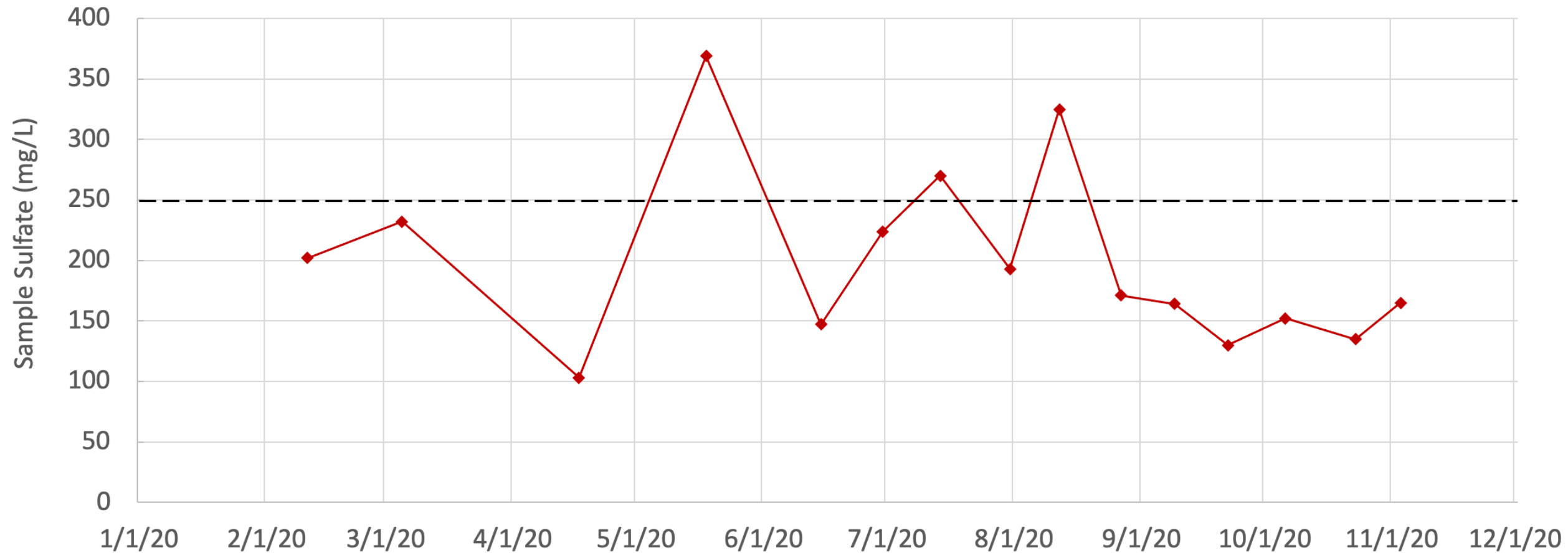
2020 FLOW AT COOPERSTOWN



2020 WATER QUALITY AT COOPERSTOWN



SULFATE MONITORING AT PEMBINA



IJC Water Quality Objective For Sulfate At Pembina Is 250 mg/L
Average Sample Sulfate Was 188 mg/L (Jan 2020 – March 2021)

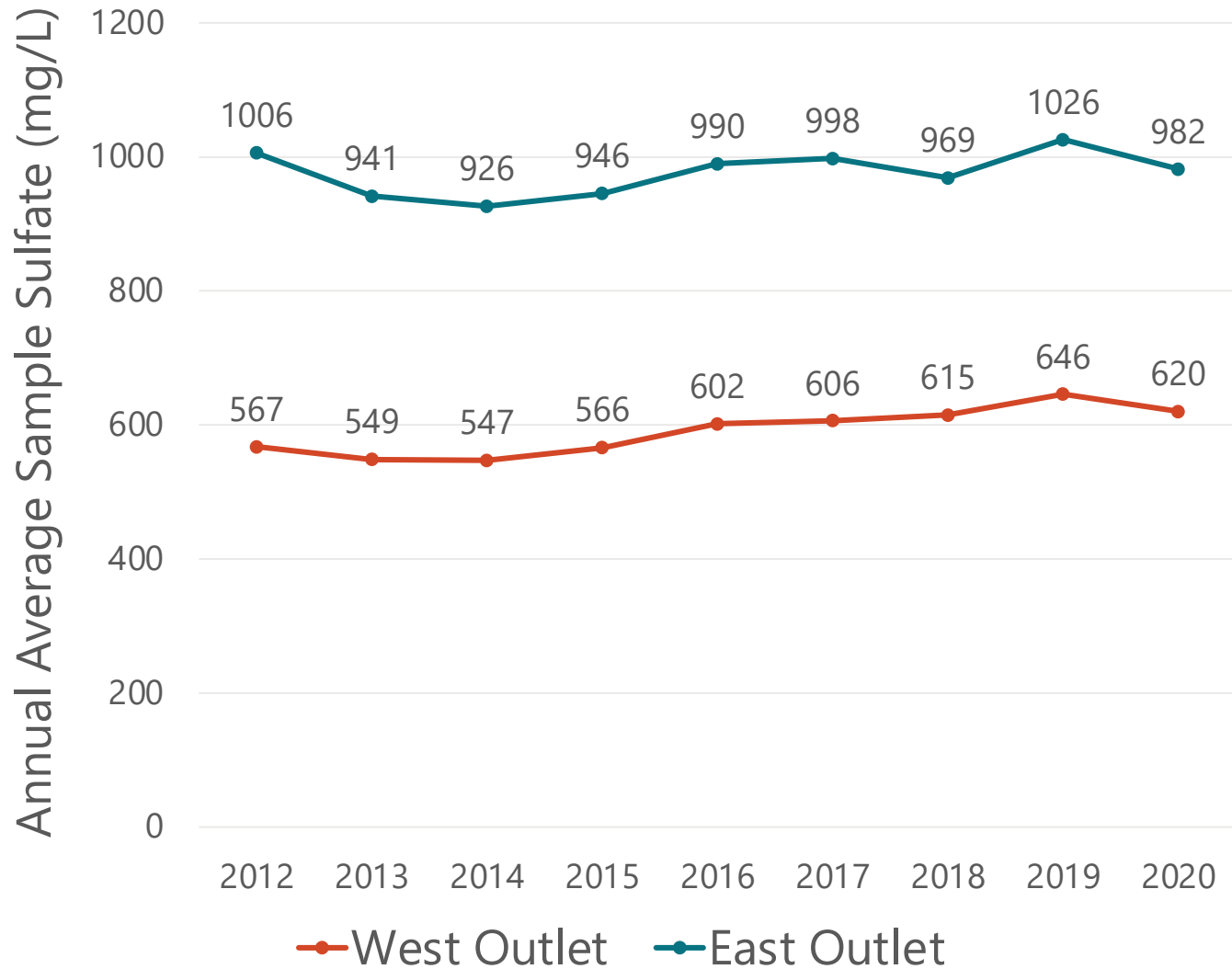
TOTAL DISSOLVED SOLIDS AT PEMBINA



IJC Water Quality Objective For Total Dissolved Solids At Pembina Is 500 mg/L

Average Sample Sulfate Was 554 mg/L (Jan 2020 – March 2021)

SULFATE TRENDS AT OUTLET INTAKES

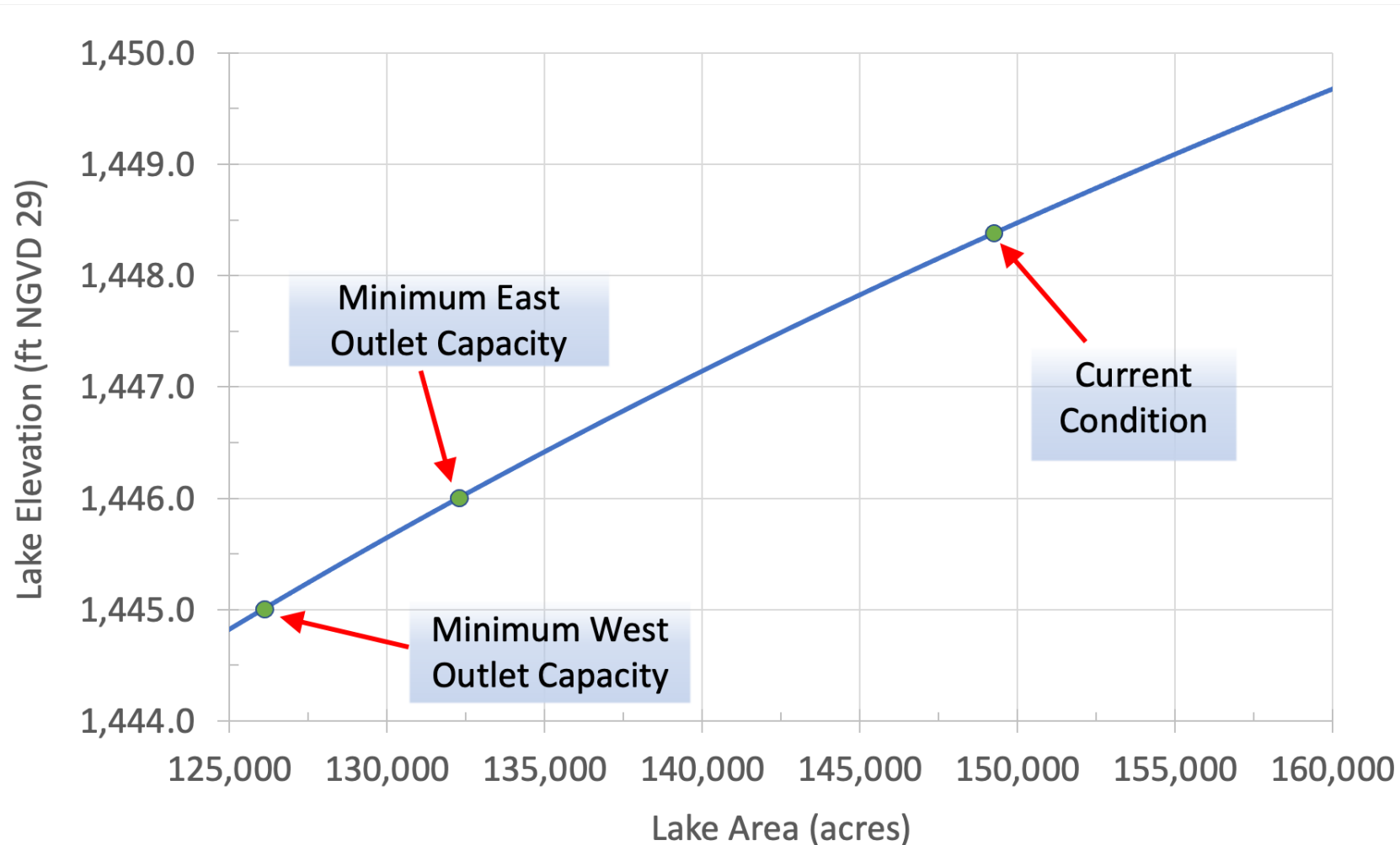


- Overall Trend Has Been Increasing Sulfate At The Intakes
- Summer Precipitation in 2020 Temporarily Reduced Sulfate Concentrations
- Recent Samples Were 670 mg/L At West Outlet & 1020 mg/L At East Outlet

OUTLOOK FOR 2021 OUTLET OPERATIONS

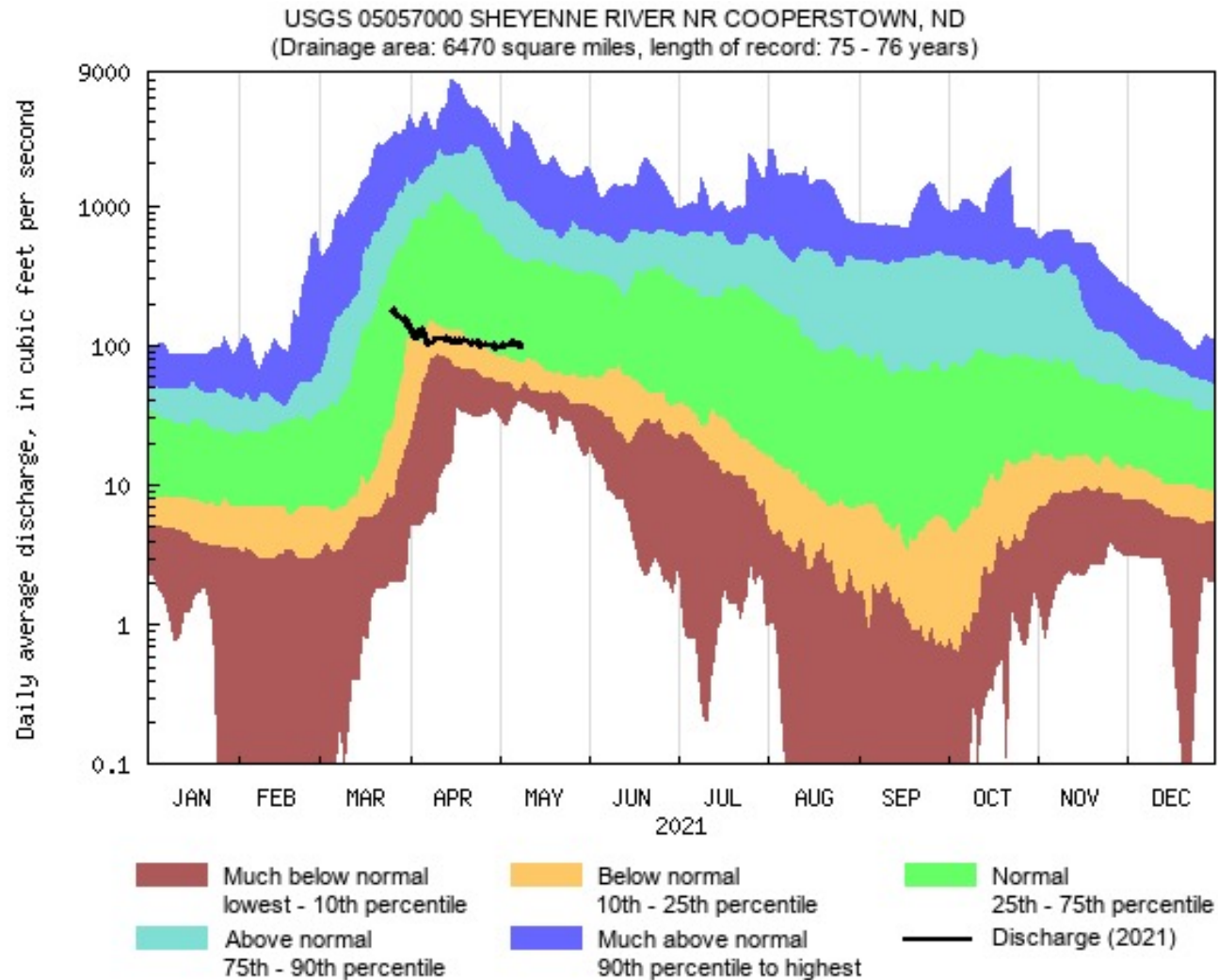


DEVILS LAKE AREA - ELEVATION



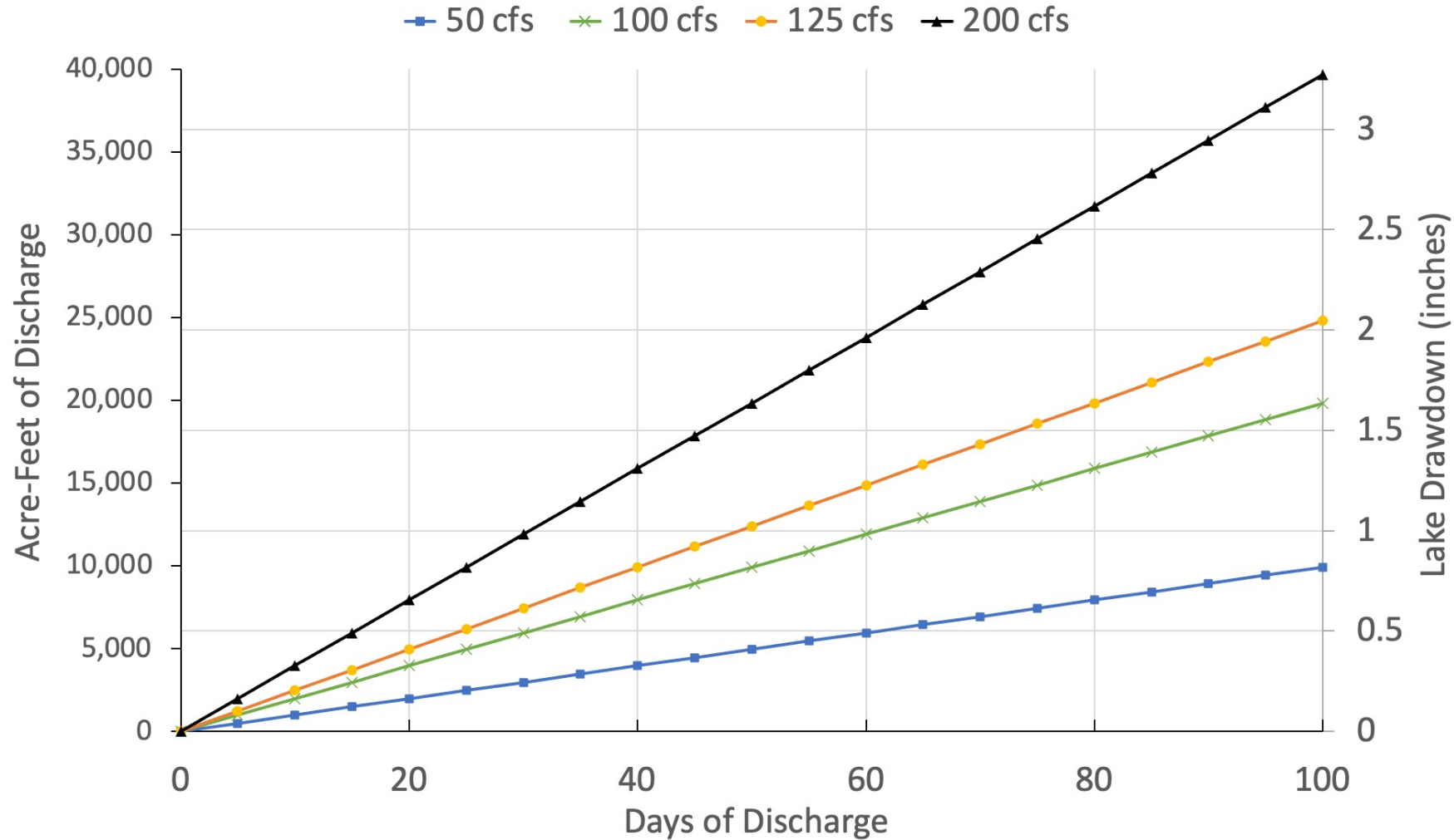
- 1 Foot Of Lake Is Approximately 7,300 Acres At 1448.0 Feet
- Current Lake Area Is Approximately 149,000 Acres
- Lake Area At 1446 Feet Is 132,250 Acres

2021 SHEYENNE RIVER FLOW



- Flow at Cooperstown Has Been Near 100 cfs For Several Weeks
- Flow Is On The Low Side Of "Normal" For The Long-Term Record But Well Below Recent Years
- Current Flow Conditions Will Not Support Steady East Outlet Operation Within the Water Quality Limitations

POTENTIAL LOW FLOW OPERATION



- 1 Inch Of Lake Is Approximately 12,000 Ac-Ft At 1448.0 Feet
- Assumed West Outlet Operation Only
- Brief Testing At East Outlet Unless Conditions Change

THANK YOU

(701) 328-2750 / swc@nd.gov

Keep Connected



Website: www.swc.nd.gov



www.facebook.com/NDStateWater



The Current Newsletter: TheCurrent@nd.gov